The Chemical Age

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Micro-Organisms in Industry

THE art of utilising living cells to bring about chemical reactions is of very ancient origin. It is certain that the fermentation industry based on the use and control of bacteria was a well-established art for thousands of years before the existence of these minute living organisms was even suspected. It is only just over a century ago that Kützing first voiced a suspicion that the conversion of alcoholic liquors into vinegar was effected by living organisms, and between 1855 and 1865 Pasteur proved that fermentation was brought about by the action of these bodies which were carried in the air, in dust, and in point of fact were ubiquitous. Fifty years ago Boutroux showed that gluconic acid was obtained from glucose by the action of the organism *Bacterium Pasteurianum.* Since then the literature of the subject has grown to colossal proportions. It describes, for example, the role of soil bacteria that have many beneficent functions such as the fixation of atmospheric nitrogen, of water bacteria that may cause purification or pollution, and of disease bacteria and their counterpart the resistant bacteria in the human body, one of whose functions appears to be to destroy the malignant type; the purification of sewage is a bacterial operation, and it is now recognised that many chemical reactions can be most conveniently brought about by exposing raw materials to the action of bacteria under controlled conditions.

Dr. A. C. Thaysen's lecture before the Society of Chemical Industry on "Micro-organisms in Industry" clearly showed that microbiology now demands the close attention of industrial chemists. Frequently, chemical reactions which require the expenditure of great effort to effect them by chemical methods, are brought about quite simply by bacterial methods. The problem of the fixation of atmospheric nitrogen, for example, was solved by man only after years of research and by the use of high temperatures and pressures. The reactions of the different bacteria are strikingly varied and unpredictable, in illustration of which may be quoted the conversion of nitrogen into proteins by one type of nitrogen bacteria, and the conversion of ammonia into nitrates or nitrites. Unquestionably, while chemists cannot now afford to neglect bacterial action as part of their normal stock-in-trade of scientific knowledge, this is a subject demanding specialisation.

Dr. Thaysen showed that bacteria, which are divided scientifically into genus, species and individuals, are so widely diversified in their action that it may be necessary to make a very exclusive selection to obtain just the right type of action. It would appear that the science of bacteriology, and particularly of chemical bacteriology, is yet in its infancy, and there is a vast amount of work yet to be done in classifying bacteria and their chemical reactions. It appears that there is hardly any substance possessing the necessary elements in an available position in the molecule that cannot serve as the bacterial food of some species or sub-species with consequent chemical reactions. An interesting feature of bacterial action is that since the chemical reactions are brought about by living organisms, the organisms, as it were, impress their individuality upon the reactions. No longer are these reactions subject to the machine-like precision of chemical laws, but they vary according to the characteristics of the individual, a fact that must be taken into account, for example, when testing disinfectants. The law of mass action no longer holds with precision. It is thus dangerous to draw generalisations from these chemical reactions before the reactions of the living cell to reagents are understood. In general, bacterial action takes place between the temperature limits of 2° C. and 65° C., the activity being increased by increase of temperature.

It is a sobering thought that one single cell, if undisturbed and with ample food, could produce enough descendents in five days to equal the weight of the earth. The fact illustrates the power of the weapon which has been put into the hand of the chemist. What use is he likely to make of that power? Dr. Thaysen indicated that chemical microbiology had two objects, one being the utilisation of micro-organisms to produce new substances from raw materials, and the other, the prevention or control of unwanted reactions; in fermentation these two objects must be achieved simultaneously.

Dr. Thaysen believes that the greatest field for chemical microbiology will not lie in the production of chemical compounds, but in the control of undesired microbiological reactions. An instance of this is the evolution of hydrogen sulphide from canal water and gasholder tanks due to the action of sulphur bacteria.

> *Statistics have been published calling attention to the fact that there will be in the future, except at times when there is a boom in the steel trade, several million tons per annum of surplus coke, or, at any rate, coke-making capacity. This state of affairs calls attention to the need for industrial planning. . . .*
>
> *—Lord Ridley.*

NOTES AND COMMENTS

Production of the Italian Chemical Industry

THE influence of national self-sufficiency on the production of the Italian chemical industry last year can be seen from the annual statistics. Imports of chemicals and related products declined by as much as 20 per cent. in value compared with 1937, while exports only fell by 2 per cent. The largest decrease in imports occurred with fertilisers, with smaller decreases in imports of industrial chemicals. A considerable decline was registered in exports of sulphur, but exports of soaps and industrial chemicals increased. About half of the imports of chemicals and related products were supplied by Germany and most of the remainder was supplied by other European countries, mainly Switzerland, the Netherlands, Belgium and France. Exports of such products went mainly to Italian colonies, with Germany the largest strictly foreign purchaser, taking 10 per cent. of the total, followed by the United Kingdom (8 per cent.) and France (7 per cent.). The production capacity of the industry increased during the year, altogether 173 new chemical plants being authorised in the twelve months, bringing the total up to 4,538 establishments.

A Wasteful Unemployment Policy

THE Prime Minister has remarked that looking forward into the future, he cannot see much prospect of any reductions of taxation. He added that every penny of expenditure would have to be watched and that the nation could not afford in these days to indulge in any schemes which would make a considerable addition to the cost of present services. But might there not be a considerable decrease in the cost of those services? Employment is rapidly improving and, according to Mr. Keynes and other economists, the time is approaching when industry will be crying out for men. This prediction was actually made before the introduction of the Military Training Bill which will withdraw 200,000 young men from gainful employment for six months. The strange thing is that with the prospect of more jobs than hands to take them the official figure of those in receipt of unemployment benefit is still over a million and a half. The Special Areas are a problem apart, but outside them we seem to be facing a position in which huge sums of public money are being handed out either to the unemployable or to men and women by way of supplementing their earnings in seasonable occupations. The conclusion can hardly be avoided that there is a great deal of waste going on to which a forceful unemployment policy could put an end.

A Plan of Assistance for the Textile Industry

MR. E. W. GOODALE, chairman of the committee of the Rayon and Silk Association, described the nature of the foreign competition which the textile industry had to meet, and the help which the industry might be given, at the Association's first meeting last week. He said that the textile industry could not increase its exports as it should while it was precluded from supplying the needs of the home market through the great quantity of foreign fabrics that were allowed to pour into the country. Japan were big exporters of textiles because in the first place they had an assured home market. Our system was not sufficiently flexible; by the Anglo-French trade agreement silk duties could not be altered without the consent of the French Government and the duties could not be increased against Japan without increasing them against all other foreign countries. In view of this, Mr. Goodale urged the President of the Board of Trade to introduce a General Powers Bill to help the textile industry in general, and the silk and rayon industries in particular. The powers suggested are to charge import duties on the home price or the export price of this country whichever is the higher, to impose Customs duties equal to the difference between the home price of an exporting country and the export price so as to negative subsidies, to impose increased duties by a *prima facie* case being made out (pending a general investigation) and to impose quotas on foreign goods coming into this country. Mr. Goodale pointed out that if the President of the Board of Trade took these powers he might never have to use them, but the possession of them and the knowledge that they could be used would give better terms for British textiles in negotiations with foreign countries.

Science and the Public

NEXT week will see the first public meeting to be held in London of the new Division for the Social and International Relations of Science of the British Association. The work of the Division will be outlined by Sir Richard Gregory, chairman of the Division, and other speeches will relate to the repercussions of scientific discovery and invention upon the social structure, and the way in which science has been applied to agriculture. The Division will hold another important meeting in June, this time in Manchester, and it is clearly being very active in its difficult task. Science, as the foundation of modern civilisation, affects every aspect of life to-day, and the problem of studying these social relations and attempting to adjust them is thus of immensely wide scope. Not the least difficult part of the work will no doubt be the interpretation of scientific work to the layman and in this connection it is interesting to see that the newly-formed Nutrition Panel of the Society of Chemical Industry is to concern itself to some extent with similar work. Dr. Magnus Pyke, writing in *Chemistry and Industry,* states that the Panel has planned a series of meetings to discuss in turn, in a manner which will be understood by the public, the particular nutritional significance of the most important foodstuffs.

Overseas Trade in April

LAST month's overseas trade, according to the Board of Trade returns, was below the levels of March and April last year. In comparison with April a year ago, imports were down by £3,622,440, exports by £2,117,616, and re-exports by £430,648. (Figures for items in the chemical trade are given on p. 379.) This gives a further reduction in the adverse trade balance of about £1,100,000. It is satisfactory from one point of view, but the position would obviously be more healthy if the reduction were obtained through an increase in exports. Lord McGowan made two suggestions for increasing export trade at last week's I.C.I. meeting. First, he suggested that a bolder course might be pursued on export credit guarantees; the limits of liability had recently been extended but the proportion of export trade covered by the scheme was still comparatively small. He added that the scheme might be more flexible and by lower rates of premium risk a loss. Secondly, he commended fuller use of British purchasing power in the conclusion of trade agreements with foreign countries.

Combustible Gases and Vapours

Factors Determining Fire and Explosion Hazards, with Special Reference to Anæsthetics

INFORMATION has been obtained by the U.S. Bureau of Mines relative to the explosibility of numerous simple and complex gaseous combustible atmospheres. Although experiments along this line have pertained largely to combustible gases in the mining and allied industry, considerable information has been obtained relative to the explosive hazards of combustible gases and vapours used as anæsthetics.

Bureau of Mines Report of Investigations 3443 (by G. W. Jones and entitled " Explosion and Fire Hazards of Combustible Anæsthetics ") states that four factors are essential for the initiation of an explosion; these are as follows: (a) combustible material (gases, liquids (vapours and mists) and solids); (b) oxygen supply (pure oxygen, normal air, atmospheres deficient in oxygen and nitrous oxide); (c) ignition sources (flames, sparks and heated materials); and (d) distribution of oxygen with respect to the combustible.

Types of Combustibles

All ordinary combustibles that are capable of producing explosions when mixed with the proper proportions of oxygen and ignited contain one or more of the following elements: Hydrogen, carbon and sulphur. These, plus nitrogen and oxygen, comprise most of the elements necessary for a discussion of explosions. Combustibles include three classes of materials, namely, gases, liquids and solids. Gases comprise a variety of substances; including the element hydrogen, combinations of hydrogen and sulphur and of carbon and hydrogen which comprise the hydrocarbon series. Combustible liquids, disregarding high explosives, include two classes of substances that may produce explosive mixtures, namely, vapours and mists. The ability of a combustible liquid to form explosive mixtures is determined by its vapour pressure or flash point. Liquids having low vapour pressures cannot normally produce explosive mixtures at ordinary temperatures. However, if these combustible liquids are finely atomised so that very fine mists or fogs are raised into the air, such mixtures are explosive. On standing, the fine mists or fogs quickly coalesce into larger droplets and settle out, and the danger of explosions is then removed. Solids include an almost unlimited number of combustible materials which, when finely ground and suspended in the air, will explode with violence when ignited.

Confining the subject to combustible anæsthetics, the oxygen supply is normal air, oxygen, nitrous oxide, or mixtures of these gases. Normal air contains 20.93 per cent. oxygen, and 0.03 per cent. carbon dioxide, and the remaining part 79.04 per cent. nitrogen and other inert gases. It is fortunate that the atmosphere is of this composition, because as the oxygen concentration is increased above 20.93 per cent., combustion processes are greatly accelerated, and the speed of flame propagation and the violence produced by combustible mixtures within the explosive limits are very much more destructive and violent than when normal air is the source of oxygen supply. On the other hand, should the oxygen content of normal air fall below 20.93 per cent., combustion processes are impeded, slowly at first as the oxygen content is reduced, but completely after the oxygen content has been reduced to definite values that vary with each combustible gas or vapour.

The fact that many combustible gases, vapours, and solids will not burn or explode when the oxygen concentration is reduced below certain definite values, varying with the material under consideration and the concentration of the material in the mixtures, offers a means of preventing explosions. This method is being used extensively at present for preventing explosions in industrial equipment and in fighting and extinguishing mine fires. The favourite materials used to reduce the oxygen concentration of gaseous mixtures are nitrogen and carbon dioxide or mixtures of the two as found in flue, etc., gas. The critical oxygen values below which combustibles are unable to produce explosions when nitrogen is used to dilute the mixtures as determined by the Bureau of Mines are given in table I.

Table I.—Oxygen values below which flames of combustible gases and vapours are extinguished.

Combustible.	Oxygen, per cent. by volume below which no mixture is inflammable.* Per cent.
Methylene dichloride	18·3
Methane	12·1
Butane	12·1
Pentane	12·1
Natural gas	12·0
Hexane	11·9
Propylene	11·5
Propane	11·4
Ethane	11·0
Ethylene	10·0
Carbon monoxide	5·6
Hydrogen	5·0

*Nitrogen used as the diluent.

Of the many hydrocarbons listed in the table, data are given for only two combustibles that have been used as anæsthetics, namely, ethylene and propylene. It is seen that for rendering ethylene incapable of producing explosions the oxygen content of the atmosphere must be kept below 10 per cent., and for propylene 11.5 per cent. Under these conditions the atmosphere becomes decidedly dangerous due to the possibility of suffocating the patient. Thus, although the addition of inert gases to explosive atmospheres, whereby the oxygen concentration is reduced to the point where explosions cannot occur, may be used to good advantage in industrial equipment, there appears to be no hope of using this method to minimise or eliminate the explosion hazards of combustible anæsthetics at present.

After dealing with the sources of ignition that may cause fires and explosions in anæsthetic practise, and how these sources of ignition may be eliminated, the author of the report points out that combustible gases and vapours are not dangerous from the explosion standpoint as long as the oxygen supply is not intimately associated with the combustibles. Dangers arise when the two become intimately mixed in the right proportions and become ignited. These right proportions come under the heading of explosive limits.

Explosive Limits

Confusion has arisen regarding the meaning of the terms " explosive limits," " inflammation limits," and " limits of inflammability." These different expressions, in the final analysis, mean the same thing. Some investigators regard explosive limits as those limiting mixtures within which flame will propagate through the entire volume of the mixture and develop considerable pressure, while inflammation limits or limits of inflammability are regarded as those limiting mixtures within which flame will propagate through the mixture indefinitely, irrespective of whether or not pressure is developed.

It is impossible to distinguish an inflammation from an explosion by the amount of violence produced. Mixtures just within the limits of inflammability, if confined in a long tube and tested for inflammability by opening one end and igniting the mixture at this open end, will propagate flame quietly and slowly through the tube (usually at a uniform speed) and the speed, for a given concentration of combustible in air, will vary with the direction of flame propagation. This same mixture, if confined in a closed bomb of sufficient size and ignited when the gases are in motion or gentle turbulence,

will propagate flame at a speed many times as fast as that in the open tube and develop pressures ranging up to 30 pounds or more per square inch. Thus the violence and pressure developed by an inflammable mixture depend on the environment and direction of flame propagation; therefore no differentiation should, or can, be made between explosive limits and limits of inflammability.

The explosive limits are affected by the direction of flame propagation, the design, diameter, and length of the test apparatus, the temperature and pressure of the mixture at the time of ignition, the percentage of water vapour present, and indirectly the source of ignition. Wider limits are obtained for upward propagation of flame than for horizontal or downward propagation, therefore the risk of an explosion is greater when the mixtures are ignited from below than when ignited from above.

anæsthetics both in air and oxygen. All these values were obtained in the explosive laboratories at the Central Experiment Station, Pittsburgh, Pa.

It will be observed that the limits vary widely for the different anæsthetics, also their explosive range both in air and oxygen. In considering the relative hazards of the various anæsthetics, the point must not be overlooked that those having the widest explosive range are not necessarily the most hazardous. Gasoline vapour, which has a very narrow range in air (1.4 to 6.5 per cent. by volume) when compared with any of the anæsthetics listed in table II, would appear to be far safer. However, experience has proved that gasoline is equally as hazardous as any of the anæsthetics named with the possible exception of diethyl ether, which has an abnormally low minimum ignition temperature in oxygen.

Factors such as minimum ignition temperature, density of

Table II.—Explosive properties of anaesthetics

Anaesthetic	Density air = 1	Limits of inflammability In air Lower	Upper	In oxygen Lower	Upper	Minimum ignition temperatures, 0° C. In air	In oxygen	Atmosphere rendered explosive by 1 pound of anaesthetic at 60° F. and 1 atmosphere of pressure, cu. ft.
Ethylene, C_2H_4	0.97	2.75	28.6	2.90	79.9	490	485	492
Propylene, C_3H_6	1.45	2.00	11.1	2.10	52.8	455	—	451
Cyclopropane, C_3H_6	1.45	2.40	10.3	2.45	63.1	498	—	376
Nitrous oxide, N_2O	1.52	—	—	Not inflammable		—	—	—
Ethyl chloride, C_2H_5Cl	2.23	4.00	14.8	—	—	517	468	147
Ether-divinyl $(C_2H_3)_2O$	2.42	1.70	27.0	1.85	85.5	399	327	319
Ether-diethyl, $(C_2H_5)_2O$	2.56	1.85	36.5	2.10	82.0	304	182	277
Chloroform, $CHCl_3$	4.12	—	—	Not inflammable		—	—	—

The limits are widened as the diameter of the apparatus is increased, rapidly at first and then more slowly as the diameter approaches 2 inches. Apparatus greater than 2 inches in diameter gives limit values very little different from those obtained with 2-inch apparatus. The apparatus must be long enough to insure continued propagation of flame after the heat imparted to the mixture by the source of ignition has been dissipated. An apparatus 3 feet or more in length is sufficient. It has been found that, if the apparatus is closed when the mixtures are ignited and ignition is initiated near the closed end when the gases are in gentle turbulence, the lower limit is reduced to some extent. Ordinary variations of laboratory temperatures have no appreciable effect on the limits. Elevated temperatures cause widening of the limits.

Normal variations of atmospheric pressure have no appreciable effect on the limits. The effect of high pressures upon the limits is neither simple nor uniform, but is specific for each inflammable mixture. As yet, no means has been developed for predicting the effect of high pressures upon the explosive limits for any given combustible in air. In certain instances both limits are raised, in others the limits are narrowed, and in some the limits are both widened and narrowed as the initial pressure at which the mixtures are ignited is increased. The normal quantity of water vapour present in atmospheres at laboratory temperatures affects the lower limit only to a slight extent. The presence of water vapour reduces the upper limit because some of the oxygen in the mixture is displaced by the water vapour; and, since the oxygen concentration is the important factor in an upper limit mixture, as the oxygen is lowered the amount of combustible that can be burned is decreased, and so the limit is lowered.

In general, less combustible is required to give a lower explosives limit in air than in oxygen. This has been thought to be due to the fact that the mean molecular heat of oxygen is higher than that of nitrogen over the range of temperatures from that of the laboratory to the flame-propagating temperatures, usually 1,200° to 1,500° C. The upper limits of all combustible gases are much higher in oxygen than in air; hence the range of explosibility in oxygen is very much greater than in air and likewise the speed of flame and violence produced on explosion are greater in these mixtures.

Safety requires that only values for the explosive limits of combustible anæsthetics be used that are obtained in apparatus giving the widest limits. Keeping this fact in mind, table 2 gives the explosive limits of the common combustible

the vapour, and the amount of atmosphere that is rendered explosive by equal weights of the different anæsthetics are of equal importance to that of the explosive limits.

Finally the report considers the density of gaseous anæsthetics and their relation to ventilation of the operating room and describes additional safety measures, such as fireproof floors for reducing fire and explosion hazards in the use of anæsthetics.

Chemical Patents

The Recent Trend of Invention

THE 56th report of the Comptroller-General of Patents, Designs and Trade Marks for the year 1938 shows that 37,973 applications for patents were made during the year, compared with 36,266 applications in 1937; 19,314 patents were sealed compared with 17,614.

Regarding the trend of invention evidenced by patents in the chemical field, the report states that the synthetic production of a wide range of organic substances continued to engage the attention of inventors. Notable among these products were artificial wool and rubber. The former is being made either by modifying the technique of artificial silk manufacture, or by the use of proteins as the basis of the fibres. Invention was active in connection with the production of synthetic rubber by the polymerisation of diolefines and halogenated diolefines. In the very active field of synthetic resins, new developments were the use of polyamide resins for making artificial yarn, and the use of resins in water purification by ion-exchange processes. Anti-oxidants or stabilisers for addition to rubber, oils, fats, soaps, aldehydes, and light-sensitive substances, normally subject to oxidation, were much in evidence.

There had been some falling off in the number of applications relating to azo and vat dyes, but, on the other hand, the development of long-chain polymethine dyes for use as photo-sensitisers was actively sustained.

Following the invention of insulin-protaminate, applications had been filed relating to insulin preparations having a similar prolonged action.

The manufacture of glass fibres of extreme fineness and of wide application had received attention, as had also the employment of short-path high-vacuum distillation for the concentration of vitamins and other products.

Oil from Coal by Low Temperature Carbonisation

New Bolsover Refinery Opened by Secretary for Mines

A NEW plant for refining oil obtained from the low temperature carbonisation of coal was opened at Bolsover on May 13 by Mr. Geoffrey Lloyd, Secretary, Mines Department.

The refinery is operated by the British Diesel Oil and Petrol Co., Ltd., a subsidiary of Low Temperature Carbonisation, Ltd. At the adjoining Coalite plant operated by the Derbyshire Coalite Co., Ltd. 180,000 tons of coal from Bolsover colliery is carbonised at low temperatures each year in the course of which about 17 gallons of crude oil for each ton of coal is produced. This crude oil can be treated for the production of motor spirit and it is with this further treatment that the new refinery is concerned. It is understood that the plant is capable of treating about 10,000,000 gallons of crude oil a year with a maximum output of about 2,500,000 gallons of motor spirit, 1,250,000 gallons of diesel oil, 1,250,000 gallons of crude cresylic acid, and 3,000,000 gallons of fuel oil and creosote.

The following is a brief description of the Coalite works and the coal oil refinery at Bolsover and the processes operated. The coal is mined at Bolsover colliery, where it is screened and washed in order to eliminate the ash. After discharge from the washery, it is loaded into wagons and taken to the tippling unit at the Coalite works. This unit, in addition to tippling the coal into the bunker conveyors, also weighs each wagon both full and empty. The coal is carried on an elevated conveyor from the tippler to the neighbouring ferro-concrete storage bunkers. There are sixteen of these, arranged in honeycomb form, and each over 70 feet high. Below each bunker there is an electrically operated portable conveyor used for the delivery of the coal to the main blending belt. By adjusting the speeds of these feeders, the quantity of each kind of coal in the blend is controlled so ensuring that the coal delivered to the reports is of constant constituency.

Retorting the Charge

The final mixture then passes by elevators and conveyors to the retort feed bunkers, situated above the eight batteries of retorts, which hold about 500 tons of coal, approximately twenty-four hours supply. From the bunkers the coal is fed to the retorts by means of travelling skips, two to each battery of thirty-six retorts. After being charged into the retorts, the coal is heated for a number of hours, depending upon the nature of the coal used, after which, it is cooled in hermetically sealed chambers below the retorts.

During the process of distillation, gas is led from the top of the retorts through the hydraulic mains to the gas-handling and by-products plant. The first condensation of the gas takes place in the hydraulic mains, and the condensed crude coal oil is led from these mains by pipes to the main storage tanks. The uncondensed gas goes on, first to the electrostatic precipitation chambers, where it is subjected to a static discharge of 80,000 volts, in order to remove all suspended matter, after which the purified gas is drawn on through condensers, and finally, passing through the petrol recovery plant, the stripped gas going to the gas holders. The gas from the gas holders is then returned to the carbonising plant, where it is used for heating the retorts.

The crude coal oil as it comes from the hydraulic mains and the condensers, is led to the neighbouring distillation plant which also treats the crude motor spirit which has been scrubbed from the gas, and has been once distilled on the Coalite plant. At the distillation plant the crude oil, is pumped as required to the service tank for the pipe still distillation unit, which is claimed to be the first of its kind in the country operating on low temperature crude oil. The crude oil is split up into four oil fractions and the solid residue, pitch. The quality of the fractions may be varied at will, and their consistency is maintained by automatic control. Most of the oil fractions from the crude oil are rich in phenolic bodies, and a considerable portion of the plant is used for their recovery and purification. After removing the phenolic bodies or tar acids, the so-called neutral or washed oils are used for the production of diesel oil and petrol, the latter being augmented by supplies of crude petrol recovered from the gas at the carbonising plants.

When the oils are recovered at the distillation unit they are pumped from the run-down tanks to the main storage tanks, from which a continuous supply is transferred to the washing plant, where all processes of washing are continuous. The tar acids are removed from the oils by washing

Col. W. A. Bristow, chairman and managing director of Low Temperature Carbonisation Ltd., pointing out features of the new works to Mr. Geoffrey Lloyd, Secretary for Mines (second from right).

with caustic soda, which takes them into solution, leaving the oil free from tar acids. The solution of tar acids in caustic soda, cresylate, is then subjected to a series of treatments for the purification of the tar acids in solution, after which the tar acids are thrown out of solution by acidifying the cresylate with carbon dioxide gas which is generated from coke in producers. After further treatment, the crude cresylic acids are transferred to storage, from which supplies are taken at intervals for the distillation stills, which are fitted with fractionating columns. The latter ensure that cresylic acids to the various standard specifications are produced.

For the production of diesel oil, various oil fractions are submitted to chemical treatment, after which the oil is again re-distilled to obtain a diesel oil to the required specification For the production of petrol, the gas spirit and oil spirit are refined by a chemical process developed by the company, the treatment taking place in a number of continuous washers. After washing, the spirit is re-distilled and given further chemical treatment.

The production of the large amount of caustic soda necessary for the extraction of tar acids, is carried out on a large scale, and, ultimately, there will be four causticisers, each of 11,000 gallons capacity, at work continuously.

Sulphamic Acid and its Derivatives

Methods of Preparation Investigated — Value of the Acid as Acidimetric Standard

A STUDY of sulphamic acid and its derivatives has been made by M. J. Butler in a thesis submitted in connection with the Ph.D. degree of Illinois University. All the methods of preparing sulphamic acid (NH_2SO_2OH) come under one of the following four type reactions:

(1) The action of ammonia or derivatives of ammonia upon certain derivatives of sulphuric acid. (*Ber.* 1919, *52*, 1,272; 1926, *59*, 1978).
(2) Nitridation of sulphurous acid or some lower valence form of sulphur. (*Ann.*, 1887, *241*, 161).
(3) Partial hydrolysis of other aquo-ammono sulphuric acids. (*J. Chem. Soc.*, 1896, *69*, 1,639).
(4) Hydrolysis of N-acyl substituted sulphamic acids. (*Ber.*, 1936, *69*, 1929; *Ind. Eng. Chem.*, 1938, *30*, 627.

Sulphamic acid is a crystalline, non-hygroscopic solid, melting with decomposition at 205° C. It is highly ionised in solution, and it ranks in acid strength with the strong acids. Many metallic sulphamates, which are characterised by extraordinary solubility in water, are known. The recent commercial development of sulphamic acid has stimulated interest in its potential possibilities. (*Ind. Eng. Chem.*, 1938, *30*, 627).

The Sulphamides

Sulphamide, $NH_2SO_2NH_2$, is another aquo-ammono sulphuric acid in which the two $-OH$ groups of sulphuric acid are replaced with $-NH_2$ groups. It is obtained through the ammonation of such sulphuryl derivatives as sulphuryl chloride (*Ber.* 1910, *43*, 138) and fluoride. Sulphamide is a white crystalline solid which melts at 93° C. It bears a close analogy to urea in its chemical reactions. A number of salts of sulphamide have been prepared. Imidodisulphamide, $NH(SO_2NH_2)_2$, and trisulphimide $(SO_2:NH)_3$ are also aquo-ammono sulphuric acids. Like sulphamide, they bear a striking relationship to the aquo-ammono carbonic acids, biuret and cyanuric acid.

Theoretically, all the aquo-ammono sulphuric acids are obtainable by the ammonolysis of sulphuric acid or its derivatives. In all cases these aquo-ammono acids undergo eventual, complete hydrolysis to sulphuric acid.

Sulphamic Acid in Acidimetry

Hofmann (*Ber.* 1912, *45*, 1,394) was the first to suggest that sulphamic acid might serve as an acidimetric standard. Herboth (*Arch. Pharm.*, 1924, *262*, 517) found that he was not able to obtain sufficiently accurate results to warrant its use as a primary standard. In view of these conflicting statements, it was considered advisable to re-examine the usefulness of sulphamic acid as a standard of reference.

The crude commercial acid was purified by recrystallisation from water; because of its non-hygroscopic nature, it could be dried in the open air. It was demonstrated conclusively by *p*H titration curves that sulphamic acid is a strong acid; it can be titrated with bases using indicators with transition ranges varying from a *p*H of 4 to 9.

In the actual experimental work which established the superiority of sulphamic acid as a primary standard, a stock solution of barium hydroxide whose hydrogen ion equivalent was carefully determined by means of constant boiling hydrochloric acid, was used to titrate weighed samples of the purified acid. Weight burettes were used, and all weighings were made on a balance sensitive to ±0.02 mg.; vacuum corrections were applied to all weighings of the solutions and samples. Brom thymol blue was the indicator selected, but the usefulness of other indicators was also demonstrated.

The experimental data obtained demonstrated conclusively that sulphamic acid can serve as an excellent primary standard. The fact that it can be purified merely by recrystallisation from water, and then need only be air-dried, is a strong

(*Continued on foot of next column.*)

Behaviour of Paraffin Wax on Cooling

Advantages of Blended Waxes showing no Transition Point

THE behaviour of paraffin wax on cooling has been studied by Scott-Harley (*Jour. Inst. Petroleum Technology*, 1939, *25*, 186, 238-251). Two methods of investigation were used: firstly, cooling curves were obtained on small samples of wax cooled at a definite known rate, and from these curves "differential" cooling curves were plotted, i.e., curves representing the rate of change of the sample temperature against time. Secondly, microscopic observations were carried out on wax contained in a cuvette recessed between two glass vessels through which thermostatted water was circulated. A thermocouple was inserted in the wax, the cuvette being closed only on three sides.

The differential cooling curve exhibited two minima and maxima. As the sample was cooled from well above the normal melting point, it supercooled quite appreciably, but at the same time developed a "set" condition with an anomalous viscosity, suggesting that it had become a liquid crystal. Solidification was marked by a minimum in the differential cooling curve, the end of this process being marked by the first maximum in the curve. The sample at this point consisted of a mass of needle-shaped crystals. Solidification is marked also by a contraction resulting in the drawing-in of air into the wax. At a temperature well below the solidification point "transition" occurs in many waxes, indicated by the second minimum rising to the second maximum in the differential cooling curve, and by a volume change and evolution of heat and the release of trapped and dissolved air. In some waxes, instead of a transition, presumably from one solid form to another, a partial liquefaction of the already solid wax occurs, which then solidifies again at a still lower temperature.

It is suggested that waxes which have been so blended as to give no transition point, should prove desirable commercially since they are more homogeneous in structure, and have greater strength, are more translucent, and have a greater water resistance than samples exhibiting the phenomenon of a transition point.

(*Continued from preceding column.*)

argument in its favour. In precision and accuracy, it compares well with other acidimetric reference materials.

In the experimental investigation of the preparation of the ammonium and alkyl amine salts of sulphamic acid, the ammonium salt was readily prepared by adding the acid directly to liquid ammonia; after evaporation of the excess solvent, the salt was obtained as a white crystalline solid. In liquid ammonia, ammonium sulphamate acts as an acid. Mono- and di-sodium sulphamate were prepared by adding a calculated quantity of the acid to weighed samples of sodium dissolved in liquid ammonia. A series of alkyl amine sulphamates were obtained by adding an equivalent amount of the finely powdered acid to the amine.

Regarding the preparation of sulphamide, the method involving the action of liquid ammonia upon sulphuryl chloride, gives sulphamide, but not in good yields. In a further study of this reaction sulphuryl chloride was allowed to react with liquid ammonia (in the presence of a considerable amount of petroleum ether as diluent) and the crude product so obtained was subjected to a liquid ammonia extraction. The results of this work show that it is possible to effect a partial removal of the more soluble sulphur-nitrogen compounds from the large amount of ammonium chloride which is always present in the ammonolysate. The crude product was also subjected to high temperature ammonolysis in an attempt to cleave imidodisulphamide (or other chain compounds which are postulated as being present) in order to increase the yield of sulphamide. The preliminary observations give evidence that the yields of sulphamide may be increased appreciably by application of this procedure.

Reactant Modifiers for Resins

Limitations of Mechanical and Solvent Plasticisers

IN an address to the Toronto Chemical Association (reported in *Canadian Chemistry and Process Industries*, 1939, *23*, 163 *et seq.*), H. C. Cheetham, director of Research and Development, Resinous Products and Chemical Co., Inc., Philadelphia, said: Usually a resin chemist no sooner obtains a new resin and catalogues its properties and behaviour, than he begins to be dissatisfied with it and busies himself with ways and means for changing it to suit this purpose or that whim. The search for plasticisers has been characteristic of this desire to obtain modifications of properties.

There seem to be two general classes of plasticisers, as far as the nature of their action is concerned: (1) mechanical; and (2) solvent. A third method of obtaining plasticising effects is by chemical reaction.

The first two classes are well known, particularly in the light of their application to nitrocellulose, cellulose acetate, and the cellulose ethers. Many are also familiar with the more recent efforts to plasticise resins with oils, high boiling solvents, etc. In most cases, however, the results of such efforts leave much to be desired, and it is noteworthy that, at least so far as the two most widely used thermosetting resins (phenol-formaldehyde and urea-formaldehyde) are concerned, the filler itself, usually of a fibrous nature, is an essential factor in rendering the material tough enough for many applications. In a sense, the filler may be considered as a mechanical plasticiser. Dibutyl phthalate has been used for many years as a softener and plasticiser in resins but, with phenolics, its compatibility is limited, and the degree of flexibility and toughness which it imparts before sacrificing too much in mechanical strength is also definitely limited. The difficulties of plasticising the usual water-soluble types of U.F. resins are also well known. It may safely be said that no satisfactory plasticiser has been developed as yet for this resin. One of the obvious disadvantages of solvent plasticisers is that they impart their own defects, such as sensitivity to water, solvents, light, etc., to the blend.

Modification by Chemical Reaction—Alkyds and Acrylates

Chemical modification as a means of plasticising has been used for a long time and very effectively, and the alkyds may be used as examples. Phthalic glyceride itself is comparatively difficult to plasticise successfully with solvent and mechanical plasticisers. In addition, it is water-sensitive and reactive, due to its acidic nature. Countless modifications have been made with various oils, fatty acids, and resin acids, and the correlation of effects produced with the chemical modifications introduced is fairly well understood. Naturally, the modifier in such cases produces more than a flexibilising or toughening effect; reactivity, stability, solubility, adhesion, etc., are usually also changed to a much greater extent than might be anticipated on the basis of additive function. In addition, there is no possibility of deterioration by separation, volatilisation, spuing, etc. In the alkyd field, at least, chemical modifications are so well established that they are taken for granted. The chemical modification or plasticising of glyceryl phthalate resins by fatty acids, non-drying, semi-drying, and drying oils, etc., has resulted in the commercial production of new and useful film-forming resins, which are finding wide commercial application. Such products are probably better known under their common trade names, such as Beckosol, Duraplex, Glyptal, Rezyl, etc.

In the field of acrylate resins, chemical modification is an effective means of varying the degree of hardness and toughness without introducing undesirable solvents. For example, alcohols of increasing molecular weight produce esters of increasing softness. These esters, however, are not mutually compatible, and, therefore, the soft esters cannot be used to plasticise the hard ones. However, by producing a chemical mixture rather than a physical one—that is, by copolymerising the monomeric esters—we obtain a resin which finds wider use than either component. In this way, the degree of hardness and toughness may be suitably varied. Resins of this type are available commercially under the trade name Acryloid, Acrysol, Crystallite, Lucite, Plexiglas, and Plexigum. They are distinguished particularly for their water-white colour, perfect transparency, extensibility, and resistance to alcohol, water, acids and solvents. They find applications in coatings, in safety glass, and in an increasing number of injection or extrusion moulding applications.

Copolymers of acrylates with vinyl resins, polystyrene, and even the diverse polymers of butadiene and its derivatives, which may be considered special cases of chemical modification, are known.

Condensation Types of Resins

The possibilities of modifying urea-formaldehyde resins by reacting with butanol are now pretty well known. Whereas the usual, simple urea-formaldehyde resin cannot be successfully plasticised with solvents to yield tough films, after suitable reaction with butanol we obtain resins which in themselves are tough and film-forming, but in addition are compatible with other film-forming materials, particularly alkyds, so that a wide range of toughness and flexibility is secured. Examples of commercial resins of this type include: Beetle and Uformite resins, which are finding rapidly increasing applications as coating composition in enamels for refrigerators, washing machines, metal furnishings, sanitary lacquers, can and drum coatings, and printing vehicles, where their extreme paleness of colour, gloss and hardness, mar-proofness, and resistance to various solvents, greases, and acids are particularly attractive.

Butanol is by no means the only reactant capable of so modifying the urea-formaldehyde resin. Apparently a wide range of hydroxylated compounds is capable of reacting with the methylol groups of the urea resins to plasticise it or otherwise modify it. Ethanol, for example, yields a resin similar in many respects to the butanol compound, but, as might be expected, it resembles also the methylol compound itself, and so we have a resin which is tougher than the simple urea-formaldehyde compound, but its solubilities are unique, for it tolerates dilution with toluol on the one hand, and dilution with water on the other. The Cellosolve compound also gives the unique combination of tolerance for both water and toluol. Isopropyl alcohol, sec-butyl, iso-butyl, and the higher alcohols, however, give hydrocarbon-soluble and water-insoluble products. As the carbon chain of the alcohol is increased, it becomes easier to obtain high solubility in hydrocarbons, even petroleum hydrocarbons. Thus, a wider compatibility with other film-forming materials, such as bodied oils, oleoresinous varnishes is achieved. It appears that the flexibility or softness of the resulting resins is not a direct function of the length of carbon chain of the alcohol used. At least, this is not strikingly evident between the range of the ethanol compound and the octyl compound. In other words, though the solubilities of the reactive resins vary according to the nature and chain-length of the alcohol, the properties of the hardened end-products approximate each other. This may be explained by the observation that the intermediates have more combined alcohol than the hardened final resins. During the hardening operation, some of the combined alcohol is split out and volatilised from the resin. The hardened resins, therefore, are closer in chemical similarity than the soluble intermediates.

The reaction may be carried out with other hydroxyl-bearing compounds. For example, castor oil, of all the oils,

shows excellent compatibility and some evidence of reactivity with this type of resin. Likewise, alkyds made from castor oil, or those prepared with an excess of glycerine or glycol, so that the final product possesses free and reactive hydroxyl groups, show some capacity for combination.

Reaction products of these alkyds with the urea resin possess properties which are not obtained in simple physical mixtures of the two.

Glycols and glycerol also react with the methylol groups. The products, naturally, are completely water-soluble, yet they differ markedly from the usual water-soluble urea-formaldehyde condensates, particularly in their speed of hardening under heat or with acid catalysts, but also in their compatibilities, for the methylol groups have lost much of their reactivity. Thus, casein and gelatin are stable when mixed at room temperatures with the glycerol-reacted product, but react rapidly with the simple methylol derivative.

Resin Reactions with Starch and Cellulose

There is considerable evidence that there is a chemical reaction between the water-soluble urea-formaldehyde condensates and starch, particularly partially hydrolised starch, and even cellulose. We assume that, if chemical reaction does take place, the hydroxyl groups of the starch and of the cellulose must be involved as they are in the formation of known formals of cellulose and of starch from formaldehyde or reactive methylene compounds. So far as modifications of simple urea-formaldehyde resin are concerned, they may be said to be plasticised by these reactants, in that the products are measurably more tough and flexible than the simple resin. The more important aspect of this reaction, however, is that starch may be modified so that its behaviour as a binder or filler in paper and fabric may be improved, particularly as to retention, washfastness, tendency to dust, and the like. Similarly, cellulose fibres, such as cotton and rayon, are modified as to resiliency—that is, resistance to crushing or creasing—by a treatment with methylol urea derivatives. This process has been long considered as simply a physical attachment of hardened urea resin to the fibre, and this is possibly the best and simplest explanation, considering all experimental data available to date. But it appears significant that (1) only the most reactive urea-formaldehyde condensates (the monomeric methylol derivatives) are suitable; (2) rayon responds more readily than cotton; and (3) cellulose acetate fibres do not respond readily to the treatment, all of which suggests that the process may involve a chemical reaction between the reactive methylol compound and the hydroxyl groups of the cellulose.

Plasticising heat-resisting phenolics has long been a serious problem, and many compromises and partial solutions have been offered. Oils have been suggested, but simple phenolic resins and oils are not compatible. But that is not a serious obstacle. For example, instead of simple phenol, select a member of the phenol family with a hydrocarbon side chain, such as butyl phenol, amyl phenol, or phenyl phenol. React such phenol with formaldehyde in the usual manner and obtain the pure, anhydrous resin. Now blend it with oils and we find complete compatibility, so that the preparation of tough, flexible products is simple. But unfortunately, the resin has lost some of the characteristic properties we usually associate with phenolics. It is no longer heat-convertible in the sense that heat will change it quickly and irreversibly to a strong, rigid, infusible material. Nor is it chemically resistant as we think of phenolic resin in the "C" stage.

Suppose we attack the phenolic hydroxyl, by etherifying or esterifying it. Even with relatively simple groups (CH_3), we lose the reactivity of the phenol for CH_2O, and so have defeated our purpose. Etherification after partial resinification is likewise ineffective.

We turn once more to the methylol group obtained in the initial products made in condensing phenol with formaldehyde in the presence of a base, and find that it may be treated in much the same manner as we treated the methylol urea resin. Butanol reacts readily to produce a modification which, in itself, is still quite reactive to heat and catalysts, but, in addition, is definitely tougher and more flexible than the unmodified product. It is capable of being hardened with heat, with or without catalysts, to the infusible, chemically-resistant stage, characteristic of unmodified phenolics. It possesses the additional advantage of being capable of forming compatible blends with various oils, and with certain rubbery hydrocarbon resins, so that additional flexibility and toughness may be imparted. This type of resin has not acquired commercial prominence as yet, but it possesses certain unique characteristics and possibilities as indicated, which may bring wider use. It is obvious that alcohols other than butanol may be used. Again, as in the previous case, the intermediate products vary widely in solubility and compatibilities, depending largely upon the nature of the alcohol; the end-products after cure resemble each other more closely.

It is also worthy of note that the methylol group is capable of being esterified, indirectly, of course, for the addition of acids to methylol derivatives of urea or phenol accelerates condensation to larger molecules. However, if phenol is reacted with formaldehyde in the presence of sufficient dimethylamine, we obtain mono, di, or tri, dimethyl amine-methyl phenols. The tri-substituted product is somewhat unique in its solubilities, being soluble in cold water, difficultly soluble in hot water. It forms salts with mineral acids which are soluble in water. Salts formed with fatty acids, such as oleic acid, are soluble in hydrocarbons. When heated with starch, some reaction takes place, insolubilising the starch, similar to the effect observed with the methylol urea compound. The advantages with the phenolic compound are twofold: (1) stability of the methylol compound when combined with dimethylamine; and (2) a greater degree of washfastness or water-insolubility in the final product. Further reaction with acetic anhydride introduces the acetate group in place of the dimethylamine group. This compound is quite stable in neutral or slightly acidic media, but resinifies rapidly on addition of strong bases.

Water Pollution

Sir Robert Robertson's Bedson Lecture

THE 46th Bedson lecture was delivered by Sir Robert Robertson, on May 8, in King's College, Newcastle-upon-Tyne. After introductory remarks, Sir Robert said he proposed to confine himself to the consideration of two recent investigations connected with the subject of water pollution. The first of these concerned the pollution problems of the River Tees, and a thorough biological and chemical survey of this river had been carried out. This had shown, that while the river was unpolluted until its union with the Skern, the entry of sewage from Darlington in this tributary caused appreciable pollution of the lower reaches. In the estuary, the condition of the river was rendered much worse by industrial refuse containing cyanide. As a result of the investigation, the sewage disposal system of Darlington had been improved, and several undertakings upon Teeside had modified their plants, so that cyanide did not enter the river.

With regard to the second topic—the disposal of milk factory waste—Sir Robert said that diluted milk, on account of its easily oxidisable nature, was a potent fish poison. As a result of its consistency, the refuse was difficult to treat by ordinary filtration methods, and success was first obtained by a modified activated sludge process. However, better results had been obtained by the use of two filters in series. The refuse was passed first to one filter, A, and thence to the second, B. When A showed signs of clogging, usually in about three weeks, the direction of flow was reversed, i.e., the liquid passed first to B, and then to A. Filter A then recovered, and in due course the direction of flow was again reversed, and so on.

Prussic Acid in Linseed Cake

Alleged Poisoning of Cattle

AFTER a five days' hearing before Sheriff Martin Laing in the Kilmarnock Sheriff Court, evidence for the defenders was not completed in the civil action in which cattle poisoning is alleged, and the case was adjourned for the hearing of further evidence and counsel's speeches until June 6. The action was brought by Thomas Drummond, farmer, of Mauchline, who is suing A. Paterson and Sons, grain and hay merchants, of Kilmarnock, for payment of £419 11s. 3d. in respect of alleged loss and damage to his cattle through using feeding stuffs supplied by defendants, and in particular linseed cake, which it is alleged contained substances capable of yielding hydrocyanic acid. Defenders deny pursuer's averments, and allege that the pasture in pursuer's field was poor in quality and contained buttercup and other weeds which were poisonous and injurious to cattle. At the first hearing in March pursuer's case was concluded, and when the action was resumed on May 8, defender's case was heard.

Arthur B. Shepherd, of London, stated that he had been for 30 years chief chemist to the British Oil and Cake Mills, Ltd. Linseed cake was one of the best-known cattle feeding stuffs in existence. It would be true to say that almost every linseed cake was capable of developing prussic acid. He had tested samples of the cake supplied to pursuer for its potential prussic acid yield and found it to be 4.1 grains per lb. That was not abnormal in any way. Apart from very exceptional cases witness had never got a yield of less than 3 grains per lb. of prussic acid from linseed cake manufactured from Indian seed, and he frequently got over 4 grains per lb. He could not imagine normal animals being poisoned if they consumed, in a dry state, linseed cake with a potential yield of 4.1 grains of prussic acid. If the cake were fed to young calves as a wet gruel without being boiled that would be a different matter because the prussic acid would be actually developed.

Hubert Gillmore, veterinary surgeon, Ayr, stated that on September 7, 1938, he visited the farm of Thomas Drummond to report on a case of illness in calves. He did not see any symptom of prussic acid poisoning in the animals. On September 18 one of the bulls, which was in a dying condition, was slaughtered and a post-mortem examination carried out. When the slaughtered bull calf's internal organs were examined a slight inflammatory condition of the fourth stomach and the intestinal tract was found. That was consistant with an irritant, and the commonest irritant was a parasitic infection.

Witness thought ridiculous the suggestion by pursuer that, three weeks after this animal got its last feed of linseed cake, prussic acid caused its heart to beat for an abnormally long time after it was killed. Prussic acid poisoning was either quickly fatal or the animal quickly and completely recovered.

Alexander Paterson, the defender, stated that on August 13 he delivered four bags of linseed cake out of a consignment of 32, to pursuer at his farm. The remainder of the linseed cake was supplied to a number of other farmers. There was no complaint from any of these farmers.

Professor W. Christopher Miller, of the Royal Veterinary College, London, said that he had read the pleadings in this case, and it was not his opinion that the animals were poisoned by prussic acid generated by linseed cake. He based that opinion on his knowledge of prussic acid poisoning and its effects and symptoms. Whatever Mr. Drummond's calves appeared to have suffered from, it appeared to have been what one could call chronic. Witness had never heard it suggested before that prussic acid poisoning in sub-lethal doses could produce a chronic condition.

Professor William Robb, of the Glasgow Veterinary College, stated that if the animals in this case got a sub-lethal dose of prussic acid at every feed he would expect the symptoms to manifest themselves immediately, but they

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(*Continued from preceding column.*)

would recover in half an hour or an hour. This was the first case on record where it was alleged that the symptoms manifested had become chronic and long continued. He had never known an illness to follow the feeding dry of linseed cake and other foodstuffs which had a potential yield of prussic acid. It should be well known among farmers that linseed cake fed wet might produce prussic acid poisoning. There had been one or two warning circulars issued by the Board of Agriculture. Prussic acid was not an irritant or corrosive poison. The condition of the intestinal tract of the animal that was slaughtered was consistent with gastro-enteritis, and that condition could be produced by plant poisoning if long continued.

Dr. D. G. O'Brien, of the West of Scotland Agricultural College, Auchincruive, said that buttercups were a recognised source of plant poisoning among live-stock. The affected animal would not recover very quickly, because buttercup poisoning had a cumulative effect.

National Service

Reserved Occupations Altered and Amplified

THE following are among the changes and amplifications specified in the revised edition of the Provisional Schedule of Reserved Occupations. (The age of reservation as set out in the schedule issued in January is given first and the second figure, where changed, is the new age of reservation. A list of additional items with the age of reservation is also appended):—

Amplification of entry and/or alteration in age of reservation.

CHEMICAL, DRUGS.—Foreman, charge hand, 30, 25.

PROCESS WORKER, PROCESS MAN IN.—Chlorine and bleach manufacture, 30, 25; manufacture of other heavy chemicals, 30, 30; manufacture of fine chemicals and galenicals, 30, 30; solvent recovery plant worker, still-house plant operator, 30, 30.

PHYSICIST.—25, 21.

METALLURGIST, 21 (as chemist in the January Schedule), 25.

CHEMICAL ENGINEER.—25, 21.

CHLORINATION, FILTRATION, AND WATER SOFTENING PLANT.—Foreman, Chargehand, 25, 25; Mechanical Filter and Water Softening Attendant, 25, 25; Water Treatment Attendant, 25, 25.

ZINC MANUFACTURE: Foreman, 21, 21; Head Smelter, First Furnaceman, 21, 21; Second Hand Furnaceman (or smelter), Third Hand Furnaceman, Tapper, Helper, Gasman, Mixing and Chasing Man, Refluxer Burner Man, Refluxer Metal Caster, Coker Discharge Man, 21, 21; Condenser, Cleaner, Rock Oxide, Clearout Man, 21, 21; Refinery Man, 21, 21; other workers other than labourers in productive processes, 25, 25.

FOOD MANUFACTURE AND PROCESSING.—All workers in productive processes other than labourers in: Butter, cheese making, milk and condensed milk processing, 30, 30; sugar manufacture and refining, glucose production, 30, 30.

Additional Items.

PEST CONTROL RESEARCH WORKER.—25.

PHARMACOLOGIST (other than member of the medical profession).—25

SCIENTIFIC RESEARCH WORKER (FULL TIME) IN A UNIVERSITY OR TECHNICAL COLLEGE.—25.

BIOCHEMIST (PLANT AND ANIMAL) (other than member of the medical profession).—25.

LINDSEY AND KESTEVEN CHEMICAL MANURES, LTD.

In the Chancery Division on Monday, Mr. Justice Crossman had before him a petition by the Lindsey and Kesteven Chemical Manure Co., Ltd., to confirm an alteration of their objects.

Mr. J. B. Lindon, for the company, said it was incorporated in 1873 and was a prosperous concern. The memorandum of association was in a very old form with the result that its activities were inconveniently restricted. It was proposed to substitute a completely new set of articles, thus putting the company on an equality with its competitors. It would be given power to trade not only in sulphuric acid, chemical, and other manures and fertilisers, but also in all other commodities and products including machinery used in any way in connection with farm and agriculture.

His lordship confirmed the objects as asked.

Proposed U.S.-Indian Trade Agreement

Effect on U.K. Preference on Certain Chemicals

A PROPOSED trade agreement between the United States and India would reduce materially the United Kingdom preference on a number of chemical products, states a report of the American Trade Commissioner, Calcutta. Imports of chemicals into India in the fiscal year 1937-38, excluding medicines and fertilisers, were valued at Rs. 33,300,000, of which approximately Rs. 17,400,000 represented imports in 29 categories, subject to duty at the rate of 20 per cent. for United Kingdom products and 30 per cent. for imports from other countries. Under the terms of the proposed agreement the United Kingdom would continue to receive a 10-point preferential on 18 categories of chemicals, total imports of which were valued at Rs. 9,400,000 in 1937-38, while the preference would be removed on 11 items, total trade in which represented Rs. 8,800,000.

The preference that would continue to operate in favour of the United Kingdom covers: aluminium sulphate, ammonium carbonate and bicarbonate, ammonium chloride, miscellaneous ammonia salts, calcium chloride, chlorine, copper sulphate, disinfectants other than naphthalene, lead acetate, litharge, phosphorus, caustic soda, sodium hydrosulphite, sodium hyposulphite, sodium sulphate, sodium sulphide, other sodium compounds, and zinc chloride. In some of these the United Kingdom dominates as a supplier—calcium chloride, chlorine, copper sulphate, and caustic soda. In most of the others the preference is obviously valuable in view of strong competition from Germany or Japan. The United States figures at all in only two items—disinfectants with 2,476 cwt. against 12,960 for Great Britain out of a total of 20,886 cwt. imported in 1937-38; and caustic soda, in which the United States supplied 40,058 cwt. against 468,560 from Great Britain, out of a total of 518,485.

Under the terms of the proposed agreement, the preference would be removed on: hydrochloric, nitric, sulphuric, tartaric and miscellaneous acids; anhydrous ammonia; potassium dichromate; miscellaneous potassium compounds; sodium dichromate; sodium cyanide; and sodium carbonate; as well as on a special tariff heading which includes cadmium sulphide, cobalt oxide, selenium, uranium oxide, and zinc oxide, on which no separate trade figures are obtainable. The acids are not of great importance at present, and the United Kingdom get little of the business, which is dominated by Japan and Germany despite the former preference. In some of these items the United States has a certain interest. Imports of anhydrous ammonia in 1937-38 totalled 2,510 cwt., of which 1,635 came from the United Kingdom, 477 from the United States, and 216 from Germany. Potassium dichromate imports totalled 5,509 cwt., of which 2,672 were from Germany, 1,382 from Japan, 956 from the United Kingdom, and 450 from the United States. Sodium dichromate imports totalled 20,762 cwt., of which 15,347 came from the United Kingdom, 3,553 from Germany, and 1,210 from the United States. Important business in sodium carbonate totalled 1,487,632 cwt., including 1,315,781 from United Kingdom, 115,024 from Kenya, 29,351 from Japan, and 26,015 from the United States.

Letters to the Editor

Civil Defence Bill

SIR,—Your readers would perhaps be interested to know that the leaflet on the Civil Defence Bill as it affects industrial and commercial establishments, has been printed and copies may be obtained, free of charge, on application to the Air Raid Precautions Department, Publicity Section, Horseferry House, Thorney Street, S.W.1. Return postage should be enclosed.—Yours faithfully,

Press Officer, F. W. HILLIER.
Lord Privy Seal, Home Office, S.W.1

RECENT TRADE LITERATURE

The 1939 edition of the City of Birmingham handbook has recently been issued by the BIRMINGHAM INFORMATION BUREAU. Comprising 352 pages in all it contains a wealth of detail, supplemented by illustrations, of the city's history and civic administration, amenities, social services, civic undertakings, etc.

THE FOSTER INSTRUMENT CO., LTD., have issued a new broadsheet which is a unique effort both in size and quality of production. It illustrates the Foster recording pyrometer and dial recorder in actual size, and in full colours. On the inside, which opens out to 21½ in. deep by 31 in. wide, is a full description with six views of individual sections of the Strip recorder.

THE KESTNER EVAPORATOR AND ENGINEERING CO., LTD., have recently issued Leaflet No. 266 (superseding No. 183) which describes several of the company's types of evaporators. Among those mentioned are multi-circulation evaporators, acid evaporators, laboratory type evaporators and horizontal evaporators.

THE CAMBRIDGE INSTRUMENT CO., LTD., have recently issued a folder describing their electrically operated automatic regulators. These are claimed to be suitable for almost any industrial application and are widely employed to control both electric and gas fired furnaces, the former through the medium of contactors, and the latter by means of automatic valve gear. Descriptions and standard specifications are given of an indicating controller, a recording controller and a potentiometer controller.

"Visco" unit dust collectors for surface grinders, cylinder grinders, tool and cutter grinders, etc., form the subject of a brochure recently issued by the VISCO ENGINEERING CO., LTD. The units may be fixed either on the floor adjacent to the grinders, or overhead, and each incorporates a motor- or belt-driven fan. A complete plant comprises a hood designed to enclose the wheel so far as practicable without obstructing the operator's view of the work being undertaken, either rigid or flexible connecting pipe, and the dust collector proper, all types of which are claimed to recover about 98 per cent. of the dust entrained in the air stream entering the collector. The cleaned air can, in most instances, be allowed to discharge into the workroom without resorting to external piping.

STANNOUS CHLORIDE IN QUANTITATIVE DETERMINATION OF SELENIUM AND TELLURIUM

A process of fairly general applicability for the determination of subordinate amounts of selenium and tellurium is described by Schoeller (*The Analyst*, 1939, *64*, 318-323). It consists in the following sequence of manipulations: acid attack, or fusion with sodium peroxide and solution in hydrochloric acid; precipitation of selenium and tellurium with ammonia on ferric hydroxide if copper and nitric acid have to be eliminated; precipitation of the two elements with stannous chloride; solution of the precipitate in brominated hydrochloric acid; precipitation of the solution with sulphur dioxide in two stages for the separation of selenium from tellurium. No evaporations of chloride solutions, and no precipitations with hydrogen sulphide or extractions with alkaline sulphide are involved. Directions are given for the application of the method to a variety of ores, metals and by-products.

A CONSIDERABLE expansion in the production of metallic copper in Germany is anticipated as a result of the development programme in Lower Silesia. Deposits in the Haasel Valley are now expected to produce 2,500 to 3,000 tons of pure copper per annum. Extensive deposits have been located in the Groditzberg region where a large flotation plant is under construction. Silesian ore reserves, in the opinion of experts, represent at least one million tons of copper.

Sheep Dips

Suggested Practical Formulæ for Commercial-Scale Production

THE parasites which infest sheep are commented upon and several practical formulæ for commercial-scale production of dips are suggested by Mason (*Chemical Industries*, 1939, *44*, 412-4). He states that in physical appearance dips can be divided into three classes :—

1. Dry yellow powders : (*a*). lime sulphur mixtures (*b*). sodium arsenate mixtures.
2. Pastes : (*a*). lead acetate, oxides of arsenic, sulphur, caustic soda, creosote, vegetable or animal oils and rosin.
3. Black viscous liquids : (*a*). creosote and soft soap (*b*). root extracts and soaps of oil.

Class 1.

Lime (quick)	8
Sulphur (flowers)	18
Water	74

This mixture is boiled for one hour; the water lost by evaporation is replaced, and after settling the clear solution is drawn off. One gallon is added to ten gallons of water for dipping sheep. If hydrated lime is used the quantity should be increased to 11.

Class 2.

Creosote	33
Rosin	23
Vegetable oil (C.S.)	11
Caustic soda	2
Water	11
Sodium arsenate	20

The rosin is dissolved with the aid of heat in the creosote and vegetable oil, while the caustic soda is dissolved in the water in a separate alkali-resisting container. When both solutions are homogeneous, the latter is added to the former in a slow stream, with constant stirring. The sodium arsenate is stirred in during the cooling operation, and the stirring is not stopped until a smooth mixture is obtained. This is used in the ratio of one to ten ; either pounds or gallons.

Sulphur	8
Sodium arsenate	17
Arsenious sulphide	22
Soap (rosin)	24
Water	29

In this case, the rosin soap is purchased and after being cut into small pieces is dispersed into the warm water until a stiff paste is obtained. The remaining components are then stirred in one by one preferably with the aid of a colloid mill, homogeniser, or other mixing device. If the soap cannot be bought, it can be made with rosin, water and caustic soda as in the formula above, but with the quantities changed to three of caustic soda and twenty-one of rosin. This is stirred into water before use in the ratio of one to twenty.

The Viscous Liquid Type

Class 3.

Water	9
Rosin	19
Caustic soda	2
Phenol	12
Kerosene	58

Diluted in the ratio of one to twenty-four before use.

The rosin and phenol are dissolved with the aid of heat in the kerosene or more pleasant smelling varnoline with the usual precautions against fire, while the caustic soda is dissolved in the water in a separate container which resists alkalies. When the two are homogeneous, the latter is poured slowly into the former with vigorous agitation. After cooling, it should be passed through a colloid mill. This is a less viscous type of emulsion.

Water	12
Rosin	18
Caustic soda	2
Phenol	4
Varnoline	64

The method of mixing is the same as the formula above, and is to be diluted in the ratio of one to eight before use.

Coconut oil	34	3
Pine oil	15	1
Rosin	283	25
Creosote oil	634	64
Caustic soda	34	3
Water		4

The first three components are melted and stirred until homogeneous. The creosote oil is then added, and after mixing, when the temperature has receded to about 55° F., the caustic soda solution is added in a slow stream with vigorous agitation. Middle oils of the creosote type are available for sale with a well defined and accurately determined phenol coefficient, which should be the guide in diluting before use.

Developments in Dip Compositions

Developments in sheep dips over the past two decades have not been directed towards completely new formulae, but for improvements in the present ones. Certain wetting agents, which can be ground into powdered dips, have improved the dispersibility of the powder in water. Sulphonated vegetable and mineral oils have been most widely adopted.

The formula below involves a wetting agent or protective colloid, which is a concentrate from the waste sulphite of paper mills.

Sodium arsenite	17
Sulphur (colloidal)	17
Sulphite concentrate	49
Sodium carbonate	7
Sulphur (powder)	7
Arsenious sulphide	3

Examples of synthetic compounds which have been introduced are monochlor or bromo naphthalenes, which are claimed to be effective when added in the amounts of ten per cent. with ten per cent. of cottonseed oil to sheep dip concentrates already in use. Another is a compound of glycerol and arsenious oxide, which can be made by simple mixing and heating until a clear syrupy liquid is obtained. Claims are that it is not lessened in potency by hard waters at the point of use and that, used alone, it is as effective as arsenic, sulphur and phenolic mixtures, now so popular.

Arsenious oxide	45
Water	12
Glycerol (anhydrous)	43

This is heated at 150° C. but if commercial glycerine, containing varying quantities of water, is used, the temperature should be 100° C., and the time of heating will, of course, be longer.

For many years there has been activity in outlying provinces of the British Empire on the use, for sheep dips, of extracts from leguminous plants, principally of the family *Derris* or *Deguelia* and the genera *Tephrosia* or *Lonchocarpus*. The extract of Derris root is now for sale in mixtures of phenolics; indicating that over the years when it was used its effectiveness was not equal to arsenic, sulphur or phenolic mixtures. Perhaps the improved scientifically controlled entomological tests of killing power developed in recent years have prompted the producers to add other ingredients. One example is given below :—

Derris extract	3
Cresylic acid	8
Hydrocarbon (mineral) oil	940
Ammonium oleate	49

The extract is made by crushing the roots, stirring the pulp with water, separating the milky emulsion by filtration or settling, and finally obtaining the active ingredient by distillation in vacuum or breaking the emulsion by salts or alkalies.

NEW TECHNICAL BOOKS

LEATHER FINISHES. By J. S. Mudd. Pp. 113. London: A. Harvey. 10s. 6d.

So comparatively little has been published on the subject of pigment finishing that a small book such as this should be invaluable to students of leather manufacture. The primary object of the book is to give the users of all types of finishes some information on their composition, the raw materials used in their manufacture and the methods by which they are produced. The subject of the more recently introduced cellulose finishing processes, and the formulation of finishes of this type is among the information given which should be useful to the leather finisher.

CASEIN AND ITS INDUSTRIAL APPLICATIONS. By E. Sutermeister and F. L. Browne. American Chemical Society Monograph Series. Second Edition. Pp. 405. London: McGraw-Hill Publishing Co. 24s.

Since the first edition of this book appeared in 1927 remarkable progress has been made in both the production and utilisation of casein, as a consequence of which it was felt that a new edition was needed. Though there is some rearrangement of chapters, the general plan and scope of the book remains unaltered. Nearly all the chapters have been thoroughly revised or completely rewritten, and with each chapter literature, particularly patent literature, has been more extensively cited than previously.

APPLIED MATHEMATICS IN CHEMICAL ENGINEERING. By T. K. Sherwood and C. E. Reed. Pp. 403. London: McGraw-Hill Publishing Co. 24s.

Though this book is written by chemical engineers who do not profess to be mathematicians, the authors express the hope that their efforts will be helpful to those who have found books on applied mathematics written by mathematicians to be unsatisfactory, and that the book may be of sufficient practical use to offset its deficiencies from the mathematical point of view. A perusal of the contents, however, leads one to the conclusion that the authors are unnecessarily modest in their apology for not being mathematicians. The wealth of detail given covers a wide field in applied mathematics and the concise and lucid explanations delivered make it possible for anyone with a good grounding in calculus to follow the text without great difficulty. Integration and differentiation, the use of differential equations, infinite series, numerical analysis and theory of errors and precision of measurements are among the subjects covered by the nine chapters in the book.

A TEXT-BOOK OF QAUNTITATIVE CHEMICAL ANALYSIS. By A. C. Cumming and S. A. Kay. Seventh edition revised by F. C. Guthrie and J. T. Nance. Pp. 496. London: Gurney and Jackson. 15s.

As in the case of previous editions the whole text of this book has been reset, and in order to allow of the inclusion of additional methods of analysis, the section on organic chemistry has been omitted. It is felt that those who were likely to use this section would of necessity require to consult a more specialised account of the analysis of organic substances than can be given in one chapter. Part II on volumetric analysis has been to some extent rearranged in order to group together similar types of analyses in a more systematic manner. Among the new material incorporated in the present edition the revisers have selected methods for the determination of some of the less common elements, for the most part in their compounds free from interfering constituents. This is intended to serve as a preparation for their determination in more complex sources. The determination of gold, lithium, molybdenum, platinum, strontium, titanium, tungsten and vanadium has been treated. An account has been added of the theory of oxidation-reduction titrations, and to the section of electrometric titrations, which was given in the sixth edition, there have been added examples of similar methods applied to oxidation-reduction titrations.

PERSONAL NOTES

MR. H. T. OPENSHAW has been appointed assistant lecturer in chemistry at Manchester University.

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MR. G. M. HENDERSON, of Edinburgh University, has been awarded a Commonwealth Fund Fellowship in chemistry at Princeton University, U.S.A.

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PROFESSOR W. L. BRAGG was elected president of the Institute of Physics at the Institute's annual general meeting on Wednesday. He will take office on October 1.

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DR. E. V. APPLETON, secretary of the Department of Scientific and Industrial Research, has been appointed chairman of the civil defence research committee set up by the Government.

* * * *

MR. JOHN DAVIDSON, who is chairman of the British Empire Trust Co., and a director of several other companies, has been appointed a director of J. C. and J. Field, Ltd., soap and candle manufacturers.

* * * *

MR. GEORGE RAYMOND FRANKISH, B.Sc., who until 1936 was senior metallurgist in the laboratories of Ruston and Hornsby, Ltd., at Grantham, has been appointed metallurgist for the British M.A.R.C., Ltd., the recently erected Grantham factory.

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MR. BERTRAM J. GEE, works chemist and assistant manager of Breedon and Cloud Hill Lime Works, Ltd., was married recently to Miss Kathleen J. Knowles. Mr. Gee is a member of the Society of Chemical Industry and of the Institute of Fuel.

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MR. TREVOR POTTS, chief chemist at Stoneclough Mills, belonging to Robert Fletcher and Co., Ltd., paper makers, has been offered the position of chairman of the National Industrial Safety Conference, which meets yearly at Oxford, and is organised by the National Safety First Association.

* * * *

PROFESSOR H. FREUNDLICH, of the University of Minnesota, U.S.A., a distinguished colloid chemist, and PROFESSOR G. VON HEVESEY, of the Institute of Theoretical Physics, Carlsberg Laboratory, Copenhagen, who discovered hafnium in 1923, have been elected to the foreign membership of the Royal Society.

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MR. JOHN A. MILNE, C.B.E., vice-president of the Royal Society of Arts, was re-elected President of the British Colour Council, at the Council's annual general meeting on May 11. MR. C. M. WHITTAKER, of Courtaulds, Ltd., was elected chairman, and MR. C. B. GWYNN, of the Bradford Dyers' Association, Ltd., was elected one of the two vice-chairmen for the ensuing year.

OBITUARY

MR. JOSEPH THWAITES, a director of the Bleachers' Association, Ltd., has died at Heaton, Bolton, at the age of 53.

MR. DAVID L. HOWARD, vice-chairman and managing director of Howards and Sons, Ltd., and a director of Borax Consolidated, Ltd., has left estate valued at £187,790 (net personalty £178,741).

MERCURY production on the scale of 50 tons per annum will be undertaken at Hokkaido by the newly-formed Yamato Kogyosho K.K. (capital 2 million yen).

THE Comitié National des Carburants Français are considering an ambitious plan for the production of alcohol and ketones (to ensure a reserve of aviation spirit) from agricultural raw materials in the French colonies.

British Overseas Chemical Trade in April

ACCORDING to the Board of Trade returns for the month ended April 30, 1939, imports of chemicals, drugs, dyes and colours were valued at £1,322,455, an increase of £352,483 as compared with April, 1938. Exports were valued at £1,814,767, as compared with £1,833,351, a decrease of £18,584. Re-exports were valued at £52,255.

Imports

	Quantities. April 30, 1938.	Quantities. April 30, 1939.	Values April 30, 1938. £	Values April 30, 1939.
Acids—				
Acetic .. .. cwt.	4,996	13,370	5,886	17,585
Boric (boracic) .. ,,	2,035	4,525	2,304	5,153
Citric .. .. ,,	1,838	2,700	7,546	11,243
Tartaric .. .. ,,	2,299	2,020	10,657	9,387
All other sorts .. value	—	—	4,675	5,965
Borax .. .. cwt.	15,110	14,735	9,109	10,240
Calcium carbide .. ,,	91,587	174,118	46,651	83,101
Fertilisers, manufactured tons	4,813	3,441	17,628	11,592
Potassium compounds—				
Caustic and lyes cwt.	12,221	12,135	13,261	13,143
Chloride (muriate) ,,	72,280	84,656	23,753	25,373
Kainite and other potassium fertiliser salts cwt.	100,766	136,161	13,188	23,202
Nitrate (saltpetre) ,,	2,375	6,125	2,054	5,499
Sulphate .. ,,	15,760	83,044	7,270	36,506
All other compounds ,,	9,719	13,581	12,600	18,344
Sodium compounds—				
Chlorate .. ,,	1,673	2,030	1,901	2,323
Chromate and bichromate .. .. cwt.	2,908	2,486	4,043	3,325
Cyanide .. ,,	6,339	20	14,969	60
Nitrate .. .. ,,	52,924	7,204	12,711	1,769
All other compounds ,,	15,964	19,628	11,202	15,085
Chemical manufactures other sorts .. value	—	—	260,164	464,734
Drugs, medicines and medicinal preparations—				
Manufactured or prepared—				
Quinine and quinine salts .. oz.	137,843	157,977	10,958	15,362
Medicinal oils .. cwt.	8,055	6,270	17,549	14,288
Proprietary medicines value	—	—	59,547	93,239
All other sorts .. ,,	—	—	37,376	56,868
Finished dye-stuffs obtained from coal tar cwt.	4,346	3,692	149,746	125,460
Extracts for dyeing ,,	3,924	4,568	7,036	8,161
Extracts for tanning—				
Chestnut .. cwt.	27,469	28,576	22,029	19,260
Quebracho .. ,,	13,233	20,139	12,178	18,647
All other sorts .. ,,	23,335	44,052	20,057	34,840
All other dyes and dyestuffs .. .. cwt.	825	1,047	24,546	17,202
Painters' and printers' colours and materials—				
White lead (basic carbonate) .. cwt.	4,567	5,162	6,587	7,090
Ochres and earth colours cwt.	44,786	21,709	13,851	8,932
Bronze powders and other metallic pigments .. cwt.	1,592	1,007	11,838	8,031
Carbon blacks .. ,,	34,052	61,186	45,066	80,812
Other pigments and extenders, dry cwt.	29,509	36,533	7,256	8,805
Lithopone .. .. ,,	24,079	23,689	15,455	14,413
All other descriptions ,,	11,834	13,743	27,325	27,416
Total .. .. value	—	—	969,972	1,322,455

Exports

	Quantities. April 30, 1938.	Quantities. April 30, 1939.	Values April 30, 1938. £	Values April 30, 1939.
Acids—				
Citric .. .. cwt.	3,751	2,866	15,800	12,982
All other sorts .. value	—	—	21,701	26,595
Aluminium compounds tons	2,082	2,002	18,281	18,516
Ammonium compounds—				
Sulphate .. tons	26,860	31,877	176,239	193,692
All other sorts .. ,,	2,568	851	29,409	14,318
Bleaching materials—				
Bleaching powder (chloride of lime) .. cwt.	51,117	45,773	14,133	14,412
All other sorts .. ,,	4,103	7,325	11,060	19,358
Coal tar products—				
Cresylic acid .. galls.	194,294	113,560	28,125	12,221
Tar oil, creosote oil ,,	6,304,756	953,088	159,931	26,796
All other sorts .. value	—	—	22,106	7,677
Copper, sulphate of tons	4,058	2,446	62,771	41,292
Disinfectants, insecticides, etc. .. .. cwt.	32,568	30,036	70,117	66,796
Fertilisers, manufactured tons	6,174	7,730	37,279	48,267
Glycerine .. .. cwt.	7,253	4,953	29,939	11,688
Lead compounds .. ,,	17,585	14,178	23,980	21,018
Magnesium compounds tons	413	517	10,758	14,901
Potassium compounds cwt.	9,347	7,054	12,267	10,908
Salt (sodium chloride) tons	14,265	16,092	39,559	45,291
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	252,643	447,619	62,791	102,939
Caustic .. .. ,,	127,639	217,434	74,694	112,503
Silicate (water glass) ,,	23,961	19,862	7,049	5,965
Sulphate, including salt cake .. .. cwt.	89,471	13,068	11,708	2,428
All other sorts .. ,,	40,397	58,347	61,347	74,097
Zinc oxide .. tons	1,389	1,263	26,626	22,019
All other descriptions value	—	—	190,055	197,451
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	163,729	137,539	19,040	15,845
Proprietary medicines value	—	—	108,341	100,549
All other descriptions ,,	—	—	119,493	138,145
Dyes and dye-stuffs and extracts for dyeing and tanning—				
Finished dye-stuffs obtained from coal tar—				
Alizarine, alizarine red and indigo (synthetic) cwt.	759	772	7,181	6,943
Other sorts .. ,,	4,304	6,418	55,139	105,919
Extracts for tanning ,,	13,575	18,174	11,095	17,956
All other descriptions ,,	1,298	1,905	7,300	8,738
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	14,504	11,901	12,605	10,432
Other descriptions ,,	11,694	9,272	22,943	27,463
White lead .. ,,	5,256	4,217	10,747	8,379
Ships' bottom compositions .. .. cwt.	2,644	2,780	9,260	9,073
Lithopone .. .. ,,	7,910	6,804	6,179	5,076
Paints and painters' enamels .. .. cwt.	36,414	37,965	103,603	111,840
Varnish and lacquer (clear) .. galls.	65,757	54,866	26,274	23,081
Printers' ink .. cwt.	4,261	4,305	23,175	23,858
All other descriptions ,,	40,446	41,465	73,251	77,340
Total .. .. value	—	—	1,833,351	1,814,767

Re-Exports

	Quantities. April 30, 1938.	Quantities. April 30, 1939.	Values April 30, 1938. £	Values April 30, 1939.
Chemical manufactures and products .. value	—	—	22,377	22,238
Drugs, medicines and medicinal preparations—	—	—	10,592	27,268
Dyes and dye-stuffs and extracts for dyeing and tanning .. .. cwt.	112	438	397	1,283
Painters' and printers' colours and materials cwt.	679	602	815	1,421
Total .. .. value	—	—	34,181	52,255

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General News—From Week to Week

INTERNATIONAL PAINT AND COMPOSITIONS CO., LTD., occupied new head offices this week at Grosvenor Gardens House, Grosvenor Gardens, London, S.W.1. Telephone : Victoria 3161.

THE PRICE OF MERCURY was reduced on Tuesday by £1 14s. 6d. to £16 4s. a flask. Exports of mercury from Italy have been very small this year, and the fall in price was attributed to the belief that Italy may now wish to sell the metal in order to obtain foreign exchange.

SIR KINGSLEY WOOD, Secretary of State for Air, visited the works of the Northern Aluminium Co., at Banbury, on Monday. During his tour the Air Minister saw all the processes of aluminium manufacture. Afterwards, Sir Kingsley said that an outstanding feature of the company, which he regarded as of particular importance, was the considerable effort it was making in regard to research.

TO COMMEMORATE THE CENTENARY OF PHOTOGRAPHY, the Royal Society of Arts, in collaboration with the Royal Photographic Society, is holding an exhibition of early apparatus, prints, photographs, etc., at the House of the Royal Society of Arts, John Street, Adelphi, W.C.2, from May 17 to 24. The exhibition will be open from 10 a.m. to 6 p.m. each day, except Saturday, when it will close at 1 p.m.

SHIPMENTS OF CHINA CLAY AND STONE from this country during April were very satisfactory notwithstanding the European situation. Germany, Spain and Italy have been good customers for British clays, but lately the demand in these countries has been considerably affected by the political tension. There were 66,619 tons of china clay, 2,863 tons of china stone and 1,776 tons of ball clay dealt with last month, compared with a total of 55,124 tons in April, 1938.

THE TWENTIETH ANNUAL VOLUME of proceedings of the Chemical Engineering Group of the Society of Chemical Industry has recently been published. It contains the annual report of the Group for 1938, with the names of officers and members of the committee of the Group and of the local sectional representatives for 1937-38 and 1938-39, as well as reprints of the papers (and reports of discussions) read at the Group meetings during the past year. The volume totals 115 pages.

WITH A FEW MINOR EXCEPTIONS, prices of iron and steel have been stabilised for a further period of four months from June 30. Prices of all qualities of hematite pig-iron are to be reduced by 5s. a ton and those of acid steel billets of re-rolling or forging quality increased by 5s. a ton. The discrepancy now existing between the cost of pig-iron and the sale price of the billets made is thus removed. These decisions have been reached by the associations concerned in conformity with recommendations of the British Iron and Steel Federation and with the concurrence of the Import Duties Advisory Committee.

IN THE COURSE OF HIS PRESIDENTIAL ADDRESS to the National Safety First Congress on Wednesday, Lord McGowan, chairman of Imperial Chemical Industries, Ltd., said that the present period of uncertainty in international politics was no time to slacken accident prevention activities. " War is to peace as accidents are to safety and work for lessening the risk of war is closely akin to work for lessening the risk of accidents." Re-armament and defence work had meant the re-absorption into industry of many workers whose skill had been blunted by enforced idleness. They would be working at high pressure and the accident rate might thus be expected to increase. Production must be as efficient as possible and accidents caused serious dislocation.

AFTER OCCUPYING 19 DAYS the hearing of the case against two corporation gas officials concluded at Southport on May 13 when the Bench committed for trial at Manchester Assizes the accused, James Herbert Clegg, Southport Corporation gas engineer, and William Ewart Plevin, his deputy. The allegations against them were that they effected a public mischief by the alleged supply of low quality and impure gas to the town. The chairman of the Bench, Mr. Harold Brodrick, in announcing the decision of the Bench, said : " We hold very strong opinions with regard to the action of other people connected with the gas undertaking, but our hands are tied and we cannot express our feelings, deep as they are." Each of the accused was granted bail in a personal surety of £100.

THE BRITISH ALUMINIUM CO., LTD., have opened a branch office and warehouse at Abbey Buildings, Middle Abbey Street, Dublin (telephone : Dublin 22966) under the management of Mr. D. E. Cottrell.

EXEMPTION FROM KEY INDUSTRY DUTY.—The Treasury have made an Order under Section 10(5) of the Finance Act, 1926, exempting sodium dioctyl sulphosuccinate from key industry duty from May 17, 1939, until December 31, 1939. Copies of the Treasury Order, which is entitled The Safeguarding of Industries (Exemption) No. 3 Order, 1939, may be obtained from H.M. Stationery Office.

ONE HUNDRED AND EIGHT MEN employed at the factory of the Clyde Soyameal Co., Ltd., at Shieldhall, Glasgow, came out on strike on Monday, in support of a demand for an increase in wages. At a meeting the men decided by 98 votes to 10 to remain on strike until their demands had been granted. The management of the firm, however, have refused to open negotiations until the men return to work.

CEREBOS, LTD., the salt manufacturers, have sold their French business as a result of certain difficulties and the incidence of French taxation. An announcement to that effect was made at the annual meeting of the company on May 12 by Mr. W. H. Collins, who added that since the close of the financial year the company had purchased for cash the entire business of the old-established firm of John Crampton and Co., Manchester, manufacturers of a wide range of food products.

AS PART OF THE PHYSICAL AND CHEMICAL SURVEY of our national coal resources the Bensham seam of Northumberland has now been examined over an area extending from Ashington in the north to the Tyne in the south. The results are given in a report issued on Monday by the Department of Scientific and Industrial Research (Fuel Research Survey Paper No. 47, H.M. Stationery Office 2s. 6d. net) which gives full data on twenty-five samples of the seam taken from eighteen localities. The survey aims at ascertaining the actual nature of the reserves of this country and the manner in which the coal may vary in character from place to place, so that it may be used in industry to the best possible advantage.

THE SECOND CHEMICAL ENGINEERING CONGRESS of the World Power Conference will be held in Berlin in 1940 at the invitation of the German National Committee. The German Committee has already circulated details of the technical programme of the Congress, among the items arranged being discussions on materials of construction, plant, equipment, and unit processes, energy supply in the chemical industry, etc. The International Executive Council, governing body of the World Power Conference, which met in Vienna last summer, will hold its next meeting in Zürich in July, 1939. With the formation of a new National Committee in Algeria, the National Committees of the World Power Conference now number 40.

Foreign News

THE BUTYL ALCOHOL FACTORY built by the Formosan Development Company at Kagi has now commenced production.

THE FORMATION OF A NEW PAINT AND WALLPAPER MANUFACTURING CONCERN under the style of Varija Tapettikeskus O.Y. (capital 250,000 Finnish marks) is reported from Helsingfors, Finland.

ETHYLENE GLYCOL is now being produced by the Nippon Kayaku K.K. at the rate of 30 tons per month. The company are also planning to embark upon the production of glycerine (60 tons monthly) and butyl alcohol (50 tons monthly).

POROUS NICKEL is the constructional material in the filter candles of a caustic soda pressure filtration plant now operated by the I. G. Farbenindustrie. Nickel powder from the nickel carbonyl process is sintered into cylindrical, rectangular or disc-shaped porous masses under conditions allowing of perfect control of the pore-size. The plant in question (described in the *Chemische Fabrik* of May 10) is equipped with 14 immersion filter candles each one metre in length and has a capacity of 32 tons hot caustic soda (60-70° C.) with a 50 per cent. NaOH content in a 6 to 8 hour filtration period under a pressure ranging, according to the thickness of the filter cake, from 0.3 to 2 atmospheres.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

MANUFACTURE OF SULPHUR DYESTUFF PREPARATIONS.—I. G. Farbenindustrie. (Germany, April 27, '38.) 12660.

MANUFACTURE OF CASEIN FIBRES.—I. G. Farbenindustrie. (Germany, May 5, '38.) 12966.

MANUFACTURE OF SULPHONATED KETONES.—I. G. Farbenindustrie. (Germany, April 30, '38.) 13016.

MANUFACTURE OF TRISAZO DYESTUFFS.—I. G. Farbenindustrie. (Germany, May 2, '38.) 13017.

MANUFACTURE OF SOLUTIONS OF ARYL ARSINE OXIDES.—I. G. Farbenindustrie. (Germany, May 6, '38.) 13081.

MANUFACTURE OF PLASTICS.—I. G. Farbenindustrie. (Germany, May 3, '38.) 13135.

STABILISING OF CELLULOSIC MATERIALS treated with halogenobutadienes.—Imperial Chemical Industries, Ltd. (United States, April 29, '38.) 13022.

STABILISED HYPOCHLORITE SOLUTIONS, ETC.—L. Mellersh-Jackson. (Clorox Chemical Co.). 12670.

EMULSIONS containing supersensitised 4[1]-carbocyanines.—Kodak, Ltd. (Eastman Kodak Co.). (March 29, '38.) 13015.

MANUFACTURE OF CELLULAR MASSES, ETC.—V. Lefebure, K. T. B. Scott, and Imperial Chemical Industries, Ltd. 13247.

MANUFACTURE OF HALOGENATED HYDROCARBONS.—H. C. Lumsden, and Imperial Chemical Industries, Ltd. 13246.

METHODS FOR THE REMOVAL OF RELATIVELY VOLATILE METALS from their alloys, etc.—J. Lumsden, and Calloy, Ltd. 12892.

EASILY WATER-SOLUBLE SALTS OF WOOL DYESTUFFS.—P. May (Sandoz, Ltd.). 12771.

PRODUCTION OF ELEMENTARY SULPHUR from hydrogen sulphide, etc.—Metallges, A.-G. (Germany, May 14, '38.) 13241.

TREATMENT OF OILS.—Permutit Co., Ltd., R. Milton, and I. Taussky. 12677.

MOLTEN INORGANIC SALT BATHS for thermal treatment.—Pilkington Bros., Ltd. (Corning Glass Works). 12697.

ACTIVATION OF SILVER CATALYSTS.—H. E. Potts (Carbide and Carbon Chemicals Corporation). (Oct. 14, '38.) 12935.

DEPOSITION OF ALLOYS.—Seri Holding Soc. Anon. (Italy, May 4, '38.) 13255.

TREATMENT OF LIGNIN.—E. C. Sherrard, and E. E. Harris. (United States, May 10, '38.) 13085.

PROCESS FOR IMPROVING CELLULOSE, ETC.—Soc. of Chemical Industry in Basle. (Switzerland, May 5, '38.) 12964; (Switzerland, April 19.) 12965.

MANUFACTURE OF DERIVATIVES OF HOMOPHTHALIC ACID.—Soc. of Chemical Industry in Basle. (Switzerland, May 6, '38.) 13082.

PROCESS FOR THE TREATMENT OF FABRICS which contain cellulose esters.—Soc. Rhodiaceta. (Germany, May 2, '38.) 12979.

LUBRICATING COMPOSITIONS.—Standard Oil Development Co. (United States, Oct. 19, '38.) 13059.

PREPARATION OF THIOAMIDES, ETC.—A. H. Stevens. 12658.

SOFTENING, ETC., AGENTS.—A. H. Stevens (Atlas Powder Co.). (Nov. 30, '37.) 12708.

SOFTENING, ETC., AGENTS.—A. H. Stevens. 12715.

PREPARATION OF SELENYL ARYL THIAZOLES.—Wingfoot Corporation. (United States, Aug. 23, '38.) 13066.

PROCESS, ETC., FOR EXTRACTING VALUABLE SUBSTANCES from bituminous materials.—J. Albrecht, and M. Gercke. (Germany, May 10, '38.) 1[illegible]951.

MANUFACTURE OF SODIUM BICARBONATE.—R. H. D. Barklie. 13523.

MANUFACTURE OF RESINOUS CONDENSATION PRODUCTS.—Beck, Koller and Co. (England), Ltd. (Hodgins and Hovey). 13736.

ALUMINIUM ALLOY.—Birmingham Aluminium Casting (1903) Co., Ltd., and P. Pritchard. 13432.

PREPARATION OF PHYSIOLOGICALLY ACTIVE COMPOUNDS.—C. F. Boehringer and Soehne Ges. (Germany, May 7, '38.) 13919.

MANUFACTURE OF A BITUMINOUS PRODUCT from acid sludge.—L. Bolgar. 13484.

PREPARATION OF PRODUCTS comprising aromatic sulphonic acids. L. Bolgar. 13485.

DESTRUCTIVE DISTILLATION OF ORGANIC MATERIALS.—F. J. G. van den Bosch, and Vacuum Science Products, Ltd. 13747.

MANUFACTURE OF VISCOSE ARTIFICIAL SILK.—British Enka Artificial Silk Co., Ltd., and H. D. Muller. 13509.

SOLVENTS FOR POLYMERISED SYNTHETIC SUBSTANCES.—Byk-Guldenwerke Chemische Fabrik, A.-G. (Germany, June 14, '38.) 13465.

PHOTOGRAPHIC SENSITISING DYESTUFFS.—R. B. Collins, and J. D. Kendall. 13508.

MANUFACTURE OF α-CHLOROACRYLIC ACID ESTERS.—J. W. C. Crawford, N. McLeish, and Imperial Chemical Industries, Ltd. 13394.

MANUFACTURE OF BODIES made of activated charcoal.—Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler. (Germany, May 5, '38.) 13514.

MANUFACTURE OF β-ALKOXY-ALDEHYDES.—Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler. (Germany, May 19, '38.) 13733.

PRODUCTION OF β-ALKOXY CARBOXYLIC ACIDS.—Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler. (Germany, May 19, '38.) 13734.

PRODUCTION OF UNSATURATED ACIDS, ETC.—Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler. (Germany, May 19, '38.) 13735.

MANUFACTURE OF HALIDES OF SULPHONIC ACIDS.—Deutsche Hydrierwerke, A.-G. (Germany, May 5, '38.) 13389.

MANUFACTURE OF CONDENSATION PRODUCTS.—Deutsche Hydrierwerke, A.-G. (Germany, May 5, '38.) 13530.

TREATMENT OF NITROGEN-CONTAINING MATERIALS.—Deutsche Hydrierwerke, A.-G. (Germany, May 5, '38.) 13540.

POLYMERISATION OF ORGANIC COMPOUNDS.—Distillers Co., Ltd., H. P. Staudinger, and H. M. Hutchinson. 13861.

PRODUCTION OF YEAST PREPARATIONS.—W. von Grumme-Douglas. (Germany, May 17, '38.) 13681.

MANUFACTURE OF ORGANIC COMPOUNDS.—H. Dreyfus. 13812.

ELECTRODEPOSITION OF COPPER.—E. I. du Pont de Nemours and Co. (United States, May 4, '38.) 13396.

CARBAMIDES.—E. I. du Pont de Nemours and Co. (United States, May 10, '38.) 13663.

CONVERSION OF HEAVY LIQUID FUEL into combustible gas.—Eastern Oil Refining Co., Inc. (United States, June 9, '38.) 13830.

MANUFACTURE OF ALKALINE SILICATES in powder form.—J. Floridienne Buttgenbach and Co. Soc. Anon. (Belgium, May 5, '38.) 13468; (Belgium, April 13.) 13469.

CARBONISATION OF CARBONACEOUS MATERIALS.—Institution of Gas Engineers, and F. J. Dent. 13349.

GASIFICATION OF CARBONACEOUS MATERIALS.—Institution of Gas Engineers, F. J. Dent and E. V. Appleton. 13350.

MANUFACTURE OF MONO-AZO-DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) 13825, 13826.

MANUFACTURE OF ANHYDROUS ALUMINIUM SULPHATE.—W. W. Groves (Monsanto Chemical Co.). (Nov. 17, '37.) 13828.

CONCENTRATION OF ACIDS.—Hercules Powder Co. (United States, May 10, '38.) 13854.

MANUFACTURE OF CONDENSATION PRODUCTS from trimethyl hydroquinone and halides of α, β-unsaturated carboxylic acids.—F. Hoffman-La Roche and Co., A.-G. (Switzerland, May 6, '38.) 13459.

PROCESS FOR THE RESOLUTION OF THE RACEMIC CONDENSATION PRODUCT from phytyl halides and trimethyl hydroquinone.—F. Hoffman-La Roche and Co., A.-G. (Switzerland, May 24, '38.) 13458.

PRODUCTION OF LOW-BOILING HYDROCARBONS.—R. Holroyd, D. H. P. Peel, and Imperial Chemical Industries, Ltd. 13973.

MANUFACTURE OF DYESTUFFS of the anthraquinone series.—I. G. Farbenindustrie. (Germany, May 6, '38.) 13520.

PRODUCTION OF TAR, ETC.—I. G. Farbenindustrie. (Germany, May 7, '38.) 13584; (Germany, Oct. 6, '38.) 13585; (Germany, Dec. 31, '38.) 13586; (Germany, April 19.) 13587.

MANUFACTURE OF DYESTUFFS of the anthraquinone series.—I. G. Farbenindustrie. (Germany, May 7, '38.) 13602.

MANUFACTURE OF 2-HYDROXY-NAPHTHALENE-4-SULPHONIC ACID, ETC.—I. G. Farbenindustrie. (Germany, May 16, '38.) 13686.

MANUFACTURE OF CONDENSATION PRODUCTS.—I. G. Farbenindustrie. (Germany, May 10, '38.) 13895.

MANUFACTURE OF SODIUM HYPOSULPHITE.—I. G. Farbenindustrie. (Germany, May 10, '38.) 13896.

MANUFACTURE OF CALCIUM SILICATE, ETC.—A. C. Knipe. 13487.

RESINOUS COMPOSITIONS.—Kodak, Ltd. (United States, May 4, '38.) 13390.

COLOURING MATTERS.—Manchester Oxide Co., Ltd., J. H. Clayton, and B. Bann. 13282, 13283, 13284, 13285, 13286, 13288, 13290, 13291.

COLOURING OF MATERIALS.—Manchester Oxide Co., Ltd., J. H. Clayton, and B. Bann. 13287.

MANUFACTURE OF ORGANIC COMPOUNDS.—Manchester Oxide Co., Ltd., J. H. Clayton, and B. Bann. 13289.

COATING, ETC., OF PLASTIC MATERIALS by a solution of potassium permanganate.—W A. Murray. 13983.

PROCESS FOR REFINING HYDROCARBON MIXTURES in the vapour phase.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, May 18, '38.) 13984, 13985.

SYNTHETIC RESINS, ETC.—Norton Grinding Wheel Co., Ltd. (United States, May 7, '38.) 13664; (United States, Dec. 6, '38.) 13665; (United States, Jan. 30.) 13666; (United States, May 7, '38.) 13667; (United States, Aug. 1, '38.) 13668.

STEROID DERIVATIVES.—V. A. Petrow. 13281.

PROCESS FOR IMPROVING THE RESISTANCE TO SCALING of iron-aluminium alloys.—Ruhrstahl, A.-G. (Germany, May 30, '38.) 13952.

PROCESS OF HIGH VACUUM DISTILLATION.—H. E. Potts (Distillation Products, Inc.). 13784, 13785.
MANUFACTURE OF CYCLIC KETONES.—R. Robinson. (May 5, '38.) 13440.
DEOXIDATION, ETC., OF STEEL.—Roehling'sche Eisen-und Stahlwerke Ges. (Germany, May 7, '38.) 13768.
PROCESS FOR IMPROVING THE RESISTANCE TO SCALING of iron-chromium-aluminium alloys.—Ruhrstahl, A.-G. (Germany, May 30, '38.) 13953.
PROCESS FOR IMPROVING THE RESISTANCE TO SCALING OF ALLOYS of the iron-chromium-nickel ternary system.—Ruhrstahl, A.-G. (Germany, May 30, '38.) 13954.
MANUFACTURE OF AMIDINES.—Soc. of Chemical Industry in Basle. (Switzerland, May 11, '38.) 13684; (Switzerland, April 15.) 13685.
PROCESS FOR THE REVIVIFICATION OF DECOLOURISING ADSORBENTS. Standard Oil Development Co. (United States, Sept. 27, '38.) 13488.
MANUFACTURE OF RESITES.—A. A. Thornton (Raschig Ges.). 13680.
PRODUCTION OF ARTIFICIAL FERTILISERS.—A. Tickner (Naamlooze Vennootschap Amsterdamsche Superfosfaatfabriek). 13805.
ELECTRODEPOSITION OF METALS.—W. W. Triggs (Harshaw Chemical Co.). 13801.

Complete Specifications Open to Public Inspection

MANUFACTURE OF TITANIUM PIGMENTS.—E. I. du Pont de Nemours and Co. Nov. 2, 1937. 29859/38.
METHOD OF PREPARING SILICEOUS ALUMINIFEROUS MINERALS for decomposition with acids, by igniting.—T. Goldschmidt, A.-G., and Vereinigte Aluminium-Werke, A.-G. Nov. 3, 1937. 30885/38.
METHOD FOR THE PURIFICATION OF EXTRACTS containing the adrenal cortical hormone.—Chemische Fabrik Promonta Ges. Nov. 4, 1937. 31103/38.
METHOD OF IMPROVING THE STABILITY OF ALKALINE SOLUTIONS containing azo-dyestuff components of an exclusively phenolic nature.—Naamlooze Vennootschap Chemische Fabriek L. Van Der Grinten. Nov. 5, 1937. 31645/38.
MANUFACTURE AND APPLICATION OF CONDENSATION PRODUCTS.—Soc. of Chemical Industry in Basle. Nov. 5, 1937. 31845/38.
PREPARATION OF 2-NITRO-NAPHTHALENE-4-8-DISULPHONIC ACID.—Montecatini Soc. Generale Per L'Industria, Mineraria, E. Chimica. Nov. 8, 1937. 31870/38.
PREPARATION OF NITRILES.—E. I. du Pont de Nemours and Co. Nov. 6, 1937. 32027/38.
PRODUCTION OF α-TETRAHYDRO-p-OXAZINO-ALKYL-ARYL OXYGEN COMPOUNDS.—Chemische Werke Albert. Nov. 6, 1937. 32054/38.
PROCESS FOR THE MANUFACTURE OF ACID violet-triarylmethane dyestuffs.—I. G. Farbenindustrie. Nov. 6, 1937. 32070/38.
POLYMERISATION OF VINYL COMPOUNDS.—I. G. Farbenindustrie. Nov. 6, 1937. 32141/38.

Specifications Accepted with Date of Application

CATALYTIC CONVERSION OF MIXTURES of carbon monoxide and hydrogen.—O. Evans (Ruhrchemie, A.-G.). July 27, 1936. (Convention date not granted.) 504,910.
CYANINE DYES and sensitisation of photographic emulsions.—Kodak, Ltd., and F. M. Hamer. Aug. 27, 1937. 504,821.
PLASTIC MATERIALS.—A. Renfrew, and Imperial Chemical Industries, Ltd. Sept. 2, 1937. 504,918.
PROCESS FOR THE MANUFACTURE OF ALCOHOLS OF STEROIDS doubly unsaturated in ring A.—Schering, A.-G. Feb. 1, 1937. 504,922.
PRODUCTION OF POLYMER DISPERSIONS of polymerisable organic substances.—A. Renfrew, W. E. F. Gates, and Imperial Chemical Industries, Ltd. Sept. 29, 1937. 505,012.
MANUFACTURE OF CERAMIC SILICON WARE.—M. Hauser. Oct. 6, 1936. 505,173.
MANUFACTURE OF AZO-DYESTUFFS insoluble in water.—W. W. Groves (I. G. Farbenindustrie.) Oct. 27, 1937. 505,084.
RESINOUS ESTERIFICATION PRODUCTS of inner ethers, and methods of making the same.—Atlas Powder Co., and K. R. Brown. Oct. 29, 1937. 505,016.
CASTING MAGNESIUM and its alloys.—P. Briske, and A. Luschenowsky. Oct. 29, 1937. 505,087.
PURIFICATION OF SILICA.—T. E. Hooley, and W. H. Reynolds. Nov. 2, 1937. 505,178.
MANUFACTURE OF WATER-INSOLUBLE AZODYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) Nov. 2, 1937. 505,091.
MANUFACTURE OF SULPHUR DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) Nov. 2, 1937. 504,835.
MANUFACTURE OF COMPOUNDS of the type of oestradiol esterified in 3-position.—Soc. of Chemical Industry in Basle. Nov. 20, 1936. 505,028.
MANUFACTURE OF PARTIALLY ESTERIFIED COMPOUNDS of the dihydro-oestrin series.—Soc. of Chemical Industry in Basle. Nov. 20, 1936. (Samples furnished.) 505,029.
MAKING SOLUTIONS OF CELLULOSE or cellulose compounds.—Cellulose Holdings, Ltd. Dec. 4, 1936. 505,032.
MANUFACTURE OF MOTOR FUELS.—Standard Oil Development Co. Dec. 21, 1936. 504,837.
PURIFICATION OF ALKALI METALS.—E. I. du Pont de Nemours and Co. Nov. 4, 1936. 505,097.
MANUFACTURE OF HIGH CHROMIUM IRON AND STEEL.—E. W. Colbeck, and Imperial Chemical Industries, Ltd. Nov. 3, 1937. 505,251.
MANUFACTURE OF METHACRYLIC ACID and esters thereof.—E. B. Thomas, and H. F. Oxley. Nov. 4, 1937. 505,103.
RECOVERY OF METALS from their amalgams.—E. I. du Pont de Nemours and Co. Nov. 4, 1936. 505,111.
MANUFACTURE OF ALKALI METALS.—E. I. du Pont de Nemours and Co. Nov. 4, 1936. 505,112.
RUBBER ANTIOXIDANTS.—W. Baird, R. F. Goldstein, M. Jones, and Imperial Chemical Industries, Ltd. Nov. 4, 1937. 505,113.
REGENERATION OF A HYDROXYL EXCHANGER suitable for purifying water.—I. G. Farbenindustrie. Nov. 24, 1936. 505,186.
MANUFACTURE OF RAW MATERIALS for lacquers.—I. G. Farbenindustrie. Nov. 7, 1936. 505,194.
MANUFACTURE OF CHLORINATED ALIPHATIC HYDROCARBONS.—E. I. du Pont de Nemours and Co. Nov. 5, 1936. 505,196.
MANUFACTURE OF POLYMERISATION PRODUCTS.—W. W. Groves (I. G. Farbenindustrie.) Nov. 6, 1937. 505,120.
MANUFACTURE OF PANCREAS HORMONE PREPARATIONS.—W. W. Groves (I. G. Farbenindustrie.) Nov. 6, 1937. 505,203.
MANUFACTURE OF HYDROCARBONS and other products from carbon monoxide and hydrogen.—H. Dreyfus. Nov. 6, 1937. 505,121.
REGENERATED CELLULOSE ARTICLES.—G. W. Johnson (I. G. Farbenindustrie.) Nov. 17, 1937. 505,045.
PRODUCTION OF PHOSPHATIC FERTILISERS.—Aktiebolaget Kemiska Patenter. Nov. 10, 1937. 505,047.
SEPARATION AND PURIFICATION OF KETONES of the sterol series. C. F. Boehringer and Soehne Ges. Dec. 28, 1936. 505,052.
CONVERSION OF COMPOUNDS containing triple carbon linkages into those containing double carbon linkages.—G. W. Johnson (I. G. Farbenindustrie.) Dec. 29, 1937. 504,957.
MANUFACTURE OF PLASTICISED POLYMERIC VINYLIDENE CHLORIDE PRODUCTS.—W. J. Tennant (Dow Chemical Co.). Jan. 3, 1938. 504,958.
RUBBER-SHELLAC COMPOSITIONS.—L. S. E. Ellis (Zinsser and Co., Inc., W.). April 22, 1938. 505,062.
PREPARING CALCIUM, strontium, barium, or lead salts of acid sulphuric esters with more than six carbon atoms in the molecule. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. May 31, 1937. 504,977.
REFINING HYDROCARBON OILS.—H. E. Girling (Legal representative of H. D. Elkington (deceased)). (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). June 10, 1938. 505,141.
PRODUCING A HIGH-GRADE AND HIGHLY REACTIVE ALUMINA from monobasic aluminium sulphite.—T. Goldschmidt, A.-G., and Vereinigte Aluminium-Werke, A.-G. Nov. 3, 1937. 504,899.
RECOVERY OF CONCENTRATED ALKYLENE CHLORHYDRINS from their dilute aqueous solutions.—G. W. Johnson (I. G. Farbenindustrie.) Jan. 9, 1939. 504,909.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

LACCO PROPRIETORS, LTD., London, N.W., lacquer manufacturers, etc. (M., 20/5/39.) May 6, £4,000 mortgage, to M. H. Pope, London; charged on Jetglaze Works, and 30, 32 and 34 Booth Road, Colindale Avenue, Hendon. * £4,148. April 22, 1938.

Satisfactions

BRITISH IRON AND STEEL CORPORATION, LTD., London, S.W. (M.S., 20/5/39.) Satisfaction May 3, of mortgage registered Dec. 11, 1937.
LACCO PROPRIETORS, LTD., London, N.W., lacquer manufacturers, etc. (M.S., 20/5/39.) Satisfaction May 6, of mortgage registered Nov. 9, 1933.

County Court Judgments

RESILIENT RUBBER CO., LTD., Victoria Works, Pontypridd, rubber processers. (C.C., 20/5/39.) £65 3s. 0d. Nov. 2.

Company Winding-up Voluntarily

BRITISH GLYCERINE MANUFACTURERS, LTD. (C.W.U., 20/5/39.) London, E.C. May 8.

Receiverships

J. J. RIGBY, LTD., Salford, soap manufacturers. (R., 20/5/39.) J. Moss, 28 Queen Street, Manchester, has been appointed receiver and manager May 2.

Weekly Prices of British Chemical Products

FAIRLY active conditions have prevailed in the general chemical market this week and in some directions buying orders have covered quite substantial quantities. In acids, acetic, oxalic, tartaric and citric have been in good request and a steady demand is maintained for the majority of the potash and soda compounds. The promptness with which consumers are taking up their ex-contract commitments is a very encouraging feature of the market. So far as values are concerned there are no important price changes to record and the undertone continues firm. Business in the market for coal tar products has continued more or less on the same lines as reported last week with perhaps a small expansion in the volume of spot buying orders.

MANCHESTER.—Trading conditions on the Manchester chemical market during the past week have not been unsatisfactory. Compared with recent experience there has been no falling off in the rate at which heavy chemicals are being called for against contract commitments, and in several directions an improving tendancy has been reported in this respect. A certain amount of new contract buying covering supplies over the second half of the year has also been reported, in addition to a quiet spot business. Prices are generally steady in tone, with few actual movements to record. Among the by-products the demand for carbolic and cresylic acids remains disappointing, but a moderate trade is passing in the benzoles, naphthas and toluols, values of which are well held.

GLASGOW.—Business in general chemicals has shown a slight improvement during the week for home trade, but export business has been rather quiet. Prices generally continue very firm at about previous figures, with no important changes to report.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech., 80%, £30 5s. per ton; pure 80%, £3 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech., glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £17 10s. per ton, d/d U.K. Fine white, 98%, £16 per ton, d/d U.K.

AMMONIUM DICHROMATE.—8¾d. per lb. U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £15 10s. per ton, ex store.

BARIUM CHLORIDE.—£10 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. GLASGOW: £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16 per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CALCIUM CHLORIDE.—GLASGOW: 70/75% solid, £5 12s. 6d. per ton ex store.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4⅝d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £13 per ton d/d station in drums.

CHROMIC ACID.—9d. per lb., 2½%; d/d U.K.

CHROMIC OXIDE.—11¼d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. GLASGOW: B.P. crystals, 1s. 0¼d. per lb; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £18 15s. per ton f.o.b. GLASGOW: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, £4 12s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1,260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. MANCHESTER: White, £31; brown, £30. GLASGOW: White crystals, £29 10s.; brown, £1 per ton less.

LEAD NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt to 1 ton, less 2½% carriage paid. GLASGOW: £30 per ton, less 2¼% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. GLASGOW: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY PRODUCTS.—Ammoniated B.P. (white precip.), lump, 6s. 8d. per lb.; powder B.P., 6s. 10s.; bichloride B.P. (corros. sub.), 5s. 11d.; powder B.P. 5s. 7d.; chloride B.P. (calomel), 6s. 8d.; red oxide cryst. (red precip.), 7s. 9d.; levig, 7s.; yellow oxide B.P. 7s. 1d.; persulphate white B.P.C., 6s. 10d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. 9d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. MANCHESTER: £49 to £55 per ton ex store. GLASGOW: £2 9s. per cwt. in casks.

PARAFFIN WAX.—GLASGOW: 3¾d. per lb.

POTASH, CAUSTIC.—Solid, £33 5s. to £38 per ton according to quantity, ex store; broken, £40 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. MANCHESTER: £37 per ton. GLASGOW: 4¼d. per lb.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. GLASGOW: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity.

POTASSIUM PERMANGANATE.—LONDON: 9¼d. to 10½d. per lb. MANCHESTER: B.P. 9½d. to 11½d. GLASGOW: B.P. Crystals, 10½d.

POTASSIUM PRUSSIATE.—5¼d. to 6d. per lb. MANCHESTER: Yellow, 6d. to 6¼d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store.

SALAMMONIAC.—Firsts, lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £35 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 8s. 6d. per ton.

SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 10s. per ton d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags in 1-ton lots. MANCHESTER: £10 15s. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags.

SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.
Sodium Chlorate.—£27 10s. to £32 per ton. Glasgow : £1 11s. per cwt., minimum 3 cwt. lots.
Sodium Dichromate.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts. Glasgow : 4½d. per lb., carriage paid.
Sodium Chromate.—4½d. per lb. d/d U.K. 4d. per lb. Glasgow : 4½d. net, carriage paid.
Sodium Hyposulphite.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. Manchester : Commercial, £11; photographic, £15 10s.
Sodium Metasilicate.—£14 5s. per ton, d/d U.K. in cwt. bags.
Sodium Nitrate.—Refined, £8 per ton for 6-ton lots d/d. Glasgow : £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.
Sodium Nitrite.—£18 5s. per ton for ton lots.
Sodium Perborate.—10%, £4 per cwt. d/d in 1-cwt. drums.
Sodium Phosphate.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.
Sodium Prussiate.—4d. per lb. for ton lots. Manchester : 4½d. to 5d. Glasgow : 4d.
Sodium Silicate.—£8 2s. 6d. per ton.
Sodium Sulphate (Glauber Salts).—£3 per ton d/d.
Sodium Sulphate (Salt Cake).—Unground spot. £3 to £3 10s. per ton d/d station in bulk. Manchester : £3 10s.
Sodium Sulphide.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. Manchester : Concentrated solid, 60/62%, £11; commercial, £8 10s.
Sodium Sulphite.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.
Sulphur Precip.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
Sulphuric Acid.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
Tartaric Acid.—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. Manchester : 1s. 1½d. per lb. Glasgow : 1s. 1½d. per lb., 5%, ex store.
Zinc Sulphate.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

Antimony Sulphide.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.
Arsenic Sulphide.—Yellow, 1s. 5d. to 1s. 7d. per lb.
Barytes.—£6 to £6 10s. per ton, according to quality.
Cadmium Sulphide.—3s. 0d. to 3s. 3d. per lb.
Carbon Black.—3¾d. to 4 1/16d. per lb., ex store.
Carbon Disulphide.—£31 to £33 per ton, according to quantity, drums extra.
Carbon Tetrachloride.—£41 to £46 per ton, according to quantity, drums extra.
Chromium Oxide.—Green, 10½d. to 11½d. per lb.
Diphenylguanidine.—2s. 2d. per lb.
India-rubber Substitutes.—White, 4½d. to 5d. per lb.; dark 3⅜d. to 4⅜d. per lb.
Lamp Black.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
Lead Hyposulphite.—9d. per lb.
Lithopone.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.
Sulphur.—£9 to £9 5s. per ton. Sulphur precip. B.P., £55 to £60 per ton. Sulphur precip. comm., £50 to £55 per ton.
Sulphur Chloride.—5d. to 7d. per lb., according to quantity.
Vermilion.—Pale, or deep, 5s. per lb., 1-cwt. lots.
Zinc Sulphide.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

Ammonium Sulphate.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
Calcium Cyanamide.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d.; March, £7 17s. 6d.; April/June, £7 18s. 9d.
Nitro Chalk.—£7 10s. 6d. per ton up to June 30, 1939.
Sodium Nitrate.—£8 per ton for delivery up to June 30, 1939
Concentrated Complete Fertilisers.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
Ammonium Phosphate Fertilisers.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

Benzol.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. Manchester : Crude, 11d. per gal.; pure, 1s. 8d. to 1s. 8½d. per gal.
Carbolic Acid.—Crystals, 6⅝d. to 7⅞d. per lb., small quantities would be dearer; Crude, 60's, 1s. 6d. to 1s. 9d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.
Creosote.—Home trade, 3½d. to 4d. per gal., f.o.r., makers' works; exports 6d. to 6½d. per gal., according to grade. Manchester : 3d. to 3⅝d.
Cresylic Acid.—97/99%, 1s. 3d. to 1s. 6d.; 99/100%, 1s. 9d. to 2s. 6d. per gal., according to specifications; Pale, 99/100%, 1s. 5d. to 1s. 7d.; Dark, 95%, 1s. 2d. to 1s. 3d. per gal. Manchester : Pale, 99/100%, 1s. 9d.
Naphtha.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. Manchester : 90/160%, 1s. 5d. to 1s. 7d. per gal.
Naphthalene.—Crude, whizzed or hot pressed, £4 10s. to £5 10s. per ton; purified crystals, £9 10s. per ton in 2-cwt. bags. London : Fire lighter quality, £3 to £4 10s. per ton. Manchester : Refined, £10 10s. to £11 10s. per ton f.o.b.
Pitch.—Medium, soft, 27s. 6d. per ton, f.o.b. Manchester : 26s. f.o.b., East Coast.
Pyridine.—90/140%, 12s. 6d. to 14s. per gal.; 90/160%, 10s. 6d. to 11s. 6d. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. Manchester : 10s. 6d. to 14s. per gallon.
Toluol.—90%, 2s. to 2s. 1d. per gal.; pure 2s. 4d. Manchester : Pure, 2s. 4d. per gallon, naked.
Xylol.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. Manchester : 2s. 4d. per gallon.

Wood Distillation Products

Calcium Acetate.—Brown, £6 15s. to £9 5s. per ton; grey, £8 to £8 5s. Manchester : Brown, £8; grey, £9 10s.
Methyl Acetone.—40.50%, £32 to £35 per ton.
Wood Creosote.—Unrefined, 6d. to 8d. per gal., according to boiling range.
Wood Naphtha, Miscible.—2s. 8d. to 3s. per gal.; solvent, 3s. to 3s. 5d. per gal.
Wood Tar.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

Aniline Oil.—Spot, 8d. per lb., drums extra, d/d buyer's works.
Aniline Salts.—Spot, 8d. per lb. d/d buyer's works, casks free.
Benzidine, HCl.—2s. 7½d. per lb., 100% as base, in casks.
Benzoic Acid, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.
m-Cresol 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-Cresol 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-Cresol, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.
Dichloraniline.—2s. 1½d. to 2s. 5½d. per lb.
Dimethylaniline.—Spot, 1s. 7½d. per lb., package extra.
Dinitrobenzene.—7½d. per lb.
Dinitrochlorbenzene, Solid.—£79 5s. per ton.
Dinitrotoluene.—48/50° C., 8½d. per lb.; 66/68° C., 11d.
Diphenylamine.—Spot, 2s. 2d. per lb., d/d buyer's works.
Gamma Acid, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.
H Acid.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.
Naphthionic Acid.—1s. 10d. per lb.
β-Naphthol.—£97 per ton; flake, £94 8s. per ton.
α-Naphthylamine.—Lumps, 1s. 1d. per lb.
β-Naphthylamine.—Spot, 3s. per lb.; d/d buyer's works.
Neville and Winther's Acid.—Spot, 3s. 3½d. per lb. 100%.
o-Nitraniline.—4s. 3½d per lb.
m-Nitraniline.—Spot, 2s. 10d. per lb. d/d buyer's works.
p-Nitraniline.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's works.
Nitrobenzene.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
Nitronaphthalene.—9½d. per lb.; P.G., 1s. 0½d. per lb.
Sodium Naphthionate.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.
Sulphanilic Acid.—Spot, 8¾d. per lb. 100%, d/d buyer's works.
o-Toluidine.—10½d. per lb., in 8/10 cwt. drums, drums extra.
p-Toluidine.—1s. 10½d. per lb., in casks.
m-Xylidine Acetate.—4s. 3d. per lb., 100%.

Latest Oil Prices

London, May 17.—Linseed Oil was steadier. Spot, £27 5s. per ton (small quantities); June, £24 17s. 6d.; July-Aug., £24 17s. 6d.; Sept.-Dec., £24 15s.; Jan.-April, £24 15s., sellers. Soya Bean Oil was steady. Oriental, May-June shipment, c.i.f. bulk, £18 5s. per ton. Rape Oil was quiet. Crude extracted, £31 10s. per ton; technical refined, £32 15s., naked, ex wharf. Cotton Oil was steady. Egyptian crude, £18 per ton; refined common edible, £22 10s.; deodorised, £24 10s., naked, ex mill (small lots £1 10s. extra). Turpentine was steady. American spot, 34s. per cwt.; May delivery, 33s. 6d.; and June, 33s.

Hull.—Linseed Oil.—Spot, £25 5s. per ton; May, June-Aug., and Sept.-Dec., £24 15s. Cotton Oil.—Egyptian, crude, spot, £18 per ton; edible, refined, spot, £21; technical, spot, £21; deodorised, £23, naked. Palm Kernel Oil.—Crude, f.m.q., spot, £18 10s. per ton, naked. Groundnut Oil.—Extracted, spot, £23 per ton; deodorised, £26. Rape Oil.—Extracted, spot, £30 10s. per ton; refined, £31 10s. Soya Oil.—Extracted, spot, £25 per ton; deodorised, £28. Cod Oil.—F.o.r. or f.a.s., 25s. per cwt., in barrels. Castor Oil.—Pharmaceutical, 38s. 6d. per cwt.; first, 33s. 6d.; second, 31s. 6d. Turpentine.—American, spot, 35s. 6d. per cwt.

Company News

Tate and Lyle, Ltd., have declared an interim dividend of 3½ per cent. (4½ per cent.).

Johnson, Matthey and Co., Ltd., propose adopting a completely new set of articles of association with a view to bringing them more into line with the Companies Act and modern practice.

B. Laporte, Ltd., have declared a final dividend of 17½ per cent., making 22½ per cent., less tax, for the year ended March 31 (the same). A net profit of £92,285 which is £1,943 less than that shown in previous accounts is reported.

British Alkaloids, Ltd., have declared a final dividend of 18.71 per cent., less tax, on eight per cent. participating preference shares, making 26.71 per cent., less tax (25.19 per cent.). A final dividend of 33 per cent., less tax, has also been declared on ordinary shares, making 45 per cent. (42 per cent.).

The British Cotton and Wool Dyers' Association report a profit for the year to March 31, 1939, of £100,804 (£110,061). The allowance for depreciation is increased from £35,000 to £44,330 and this reduces the net profit from £43,925 to £25,223. A dividend of 3½ per cent. (4½ per cent.) has been declared.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

South Africa.—H.M. Trade Commissioner at Johannesburg reports that the Union Tender and Supplies Board, Pretoria, is calling for tenders (Tender No. S.O. 314) for the supply and delivery f.o.b. port of shipment of chemicals and scientific instruments required for the Western Province Fruit Research Station. Tenders, endorsed "Formal Tender No. S.O. 314," should be addressed to the Secretary, Union Tender and Supplies Board, 271 Visagie Street, P.O. Box 371, Pretoria, South Africa, by whom they will be received up to 9 a.m. on Thursday, June 1, 1939. (Ref. T. 22438/39.)

France.—A well-established firm of agents at Lyons wishes to obtain the representation of United Kingdom manufacturers or exporters of chemicals, drugs, raw rubber, citronella oil, for France. (Ref. No. 410.)

Chile.—The Commercial Secretary to H.M. Embassy at Santiago, Chile, reports that the Chilean State Railways Administration is calling for tenders for the supply and delivery of:—Paints in paste form and powder, varnishes, linseed oil, turpentine, shellac, pumice stone, etc. Tenders, which must be accompanied by samples, will be received by the Jefe del Departamento de Materiales y Almacenes, Ferrocarriles del Estado, Santiago, up to 4 p.m. on June 16, 1939. (Ref. T. 22332/39.)

New Companies Registered

Dunedin Chemical Company, Ltd. 21,003.—Private company. Capital £5,000 in 5,000 shares of £1. To acquire the business of manufacturing and analytical chemists, formerly carried on at Royal Park Place, Abbeyhill, Edinburgh, as Dunedin Chemical Company. Subscribers: Williamina Mitchell, 45 Frederick Street, Edinburgh; Catherine F. Glen.

Meredith & Co. (Birmingham), Ltd. 352,660.—Private company. Capital £40,000 in 20,000 6 per cent. cumulative preference and 20,000 ordinary shares of £1 each. To acquire the business of varnish, paint and colour manufacturers carried on by W. L. Barnsley and E. S. H. Barnsley as "Meredith and Co.," at Eighteenth Century Varnish Works, Western Road, Birmingham. Directors: Wm. L. Barnsley, 324 Hagley Road, Edgbaston, Birmingham; Edward S. H. Barnsley.

P.R. Chemicals, Ltd. 352,580.—Private company. Capital £60,000 in £1 shares. To carry on the business of manufacturers, distillers, refiners of, dealers with and sellers of tar acids, coke, coal, tar, pitch, creosote, ammoniacal liquor and other residual products, alizarine coal-tar colours, dyes and dyestuffs, crude and refined oils, benzol and all products and by-products of oil and petroleum, chemicals and chemical products, etc. Subscribers: Albert Carr, 33 Walbrook, E.C.4; Cyril B. Kenworthy.

Castor Lubricants, Ltd. F.3,547.—Capital £750,000 in 1,500,000 shares of 10s. each. To carry on the business of producers, refiners and distributors of all kinds of lubricating and other oils and greases, oil extractors, pharmaceutical, manufacturing and general chemists, etc., and to adopt an agreement with the General Mining and Finance Corporation, Limited, for the acquisition of an invention or process for the production of miscible castor oil. British address: 170 Winchester House, Old Broad Street, E.C. Directors: Sir George W. Albu, Bt.; Leopold H. Mandeistraw, Calvin S. McLean, Lt.-Col. Karel Rood.

Books Received

Chemistry: A Survey. By Alan Bec. London: Victor Gollancz, Ltd. Pp. 96. 1s. 6d.

Chemical Engineering Group Proceedings. Vol. 20, 1938. London: Chemical Engineering Group. Pp. 115. 21s.

The Scientific Aspects of Artists' and Decorators' Materials. By R. S. Morrell. London: Humphrey Milford, Oxford University Press. Pp. 141. 5s.

Calcium Superphosphate and Compound Fertilisers. By P. Parrish and A. Ogilvie. London: Hutchinson's Scientific and Technical Publications. Pp. 322. 35s.

Chemical and Allied Stocks and Shares

SENTIMENT ON THE STOCK EXCHANGE has continued to benefit from the indications of improvement in home trade conditions, and movements in prices were again in favour of holders. Nevertheless, no improvement in the volume of business in industrial and other securities was reported, as the disposition is to await further evidence of an easing of tension in European politics.

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Shares of chemical and kindred companies again moved in sympathy with the better conditions in the stock and share markets. Imperial Chemical ordinary at 30s. 3d. were virtually the same as a week ago, but there was further improvement in the preference units, which are 30s. 7½d. at the time of writing, compared with 30s. a week ago. Fison Packard and Prentice ordinary shares continued to attract rather more attention; the price has improved further from 38s. 9d. to 39s. British Match were little changed at 32s. 6d. having remained under the influence of the recently-issued results, but moderate fluctuations were shown by Swedish Match shares. B. Laporte, which were more active on the dividend, have risen further from 87s. 6d. to 88s. 9d. The price still carries the scrip bonus announced by the company recently.

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Annual meeting considerations drew attention to Stewarts and Lloyds deferred units, which have made the higher price of 42s. 9d. Babcock and Wilcox rose from 42s. to 44s., while British Oxygen were good and have risen on the week from 76s. 9d. to 78s. 9d.

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Iron, steel and kindred securities were moderately better, including Dorman Long, which moved up to 30s. 7½d., and United Steel which were a few pence higher at 24s. 3d. Stanton Ironworks at 42s. 9d. have more than held last week's improvement, while Staveley Iron shares rallied from 40s. 6d. to 42s. 6d. Guest Keen and Nettlefolds were little changed at 24s. 3d., awaiting the preliminary figures for the past year's working. Tube Investments moved up from 86s. 9d. to 87s. 9d., while British Aluminium were 57s. 6d. and Murex rose to 76s. 3d. Turner and Newall were better at 76s. 6d. compared with 75s. 9d. a week ago.

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Lever and Unilever at 35s. 9d. have more than maintained the rally shown last week. The market is assuming that, bearing in mind the statements at the recent meeting, there seem reasonable grounds for the view that the dividend for the current year should be maintained. British Oil and Cake Mills preferred ordinary shares were little changed at 40s. 6d., while higher prices were recorded for the ordinary shares of Reckitt and Sons and J. and J. Colman, which were influenced by the remarks at the recent meetings.

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Barry and Staines were higher at 32s., while Michael Nairn rose to 55s. 7½d. Boots Pure Drug were little changed at 41s. 3d., awaiting publication of the full results. Timothy Whites and Taylors were slightly lower at 23s. 4½d., the disposition being to await the terms of the debenture issue referred to in the annual report. Sangers were around 20s. 6d., and British Drug Houses 21s. Beechams Pills deferred shares moved up from 7s. 7½d. to 8s. 4½d.

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In other directions Wall Paper deferred units remained at 27s. 6d., but British Plaster Board were higher at 28s. on hopes that, although the results will cover eleven months on this occasion and are expected next month, the dividend may again be brought up to 50 per cent. Associated Cement were higher at 71s. 3d. and other cement shares had a steadier appearance. "Shell" and most leading oil shares were less active, awaiting the forthcoming Anglo-Iranian and other dividend announcements.

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